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THE REVIEW
OF
APPLIED MYCOLOGY

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Pflanzenschutzbestimmungen im Ausland. Österreich. Ein- und Durchführbeschränkungen zur Verhütung der Einschleppung gefährlicher Pflanzenkrankheiten und Pflanzenschädlinge (Pflanzeneinführverordnung). Verordnung des Bundesministeriums für Land- und Forstwirtschaft vom 5. August 1954. [Foreign plant protection regulations. Austria. Import and transit restrictions for the prevention of the introduction of dangerous plant diseases and plant pests (plant import ordinance). Ordinance of the Federal Ministry for Agriculture and Forestry of 5th August, 1954.]—*Amtl. PflSchBestimm.*, N.F., 7, 4, pp. 191–196, 1955.

The current Austrian plant import restrictions contain the following amendments to those promulgated on 2nd June, 1948 [cf. *R.A.M.*, 30, p. 640]. The importation of oak and chestnut plants is prohibited. The radius from the site of origin over which wart disease (*Synchytrium endobioticum*) must have been absent during the past five years to qualify potatoes for importation is reduced from 5 to 2 km. [34, p. 478]. Azalea [*Rhododendron*] plants may be imported if accompanied by a certificate of freedom from *Septoria azaleae* and *Exobasidium azaleae*.

VUKČEVIĆ (R.). **Biljne štetočine i bolesti utvrđene na Kosmetu od 1949–1953 zodine.** [Plant pests and diseases noted at Kosmet in the years from 1949–1953.]—*Zasht. Bilja* (*Plant Prot., Beograd*), *1954*, 26, pp. 69–106, 1 map, 1954. [French summary.]

A brief review is given of a five-year (1949 to 1953) survey of plant pests and diseases in the Kosovo and Metohija region of Serbia, Yugoslavia. Among the more important diseases observed, *Puccinia* spp. on cereals rendered the crops uneconomic in some areas. *Fusicladium dendriticum* and *F. pirinum* [*Venturia inaequalis* and *V. pirina*] caused serious damage to apples and pears in 1953. In 1952 maize suffered severe losses from *Gibberella zeae*, not previously recorded in this region, and *Sorosporium reilianum* [*Sphacelotheca reiliana*: see below, p. 715] which caused up to 18 per cent. infection. *Rhynchosporium secalis* was recorded for the first time in the area on barley. *Tilletia tritici* [*T. caries*: *R.A.M.*, 31, p. 323] reduced the wheat yield by 70 to 90 per cent. in some localities in Kosovo polje.

Plum pox disease [34, p. 530] was common throughout the region, particularly on Požegača plums. Some 75 per cent. of the tomato fruits were destroyed by *Bacterium lycopersici* [4, p. 318]. *Peronospora schleideni* [*P. destructor*] was often serious on onion [34, p. 516].

Potato cultivation in some regions was practically impossible owing to the attacks by various viruses [34, p. 538] and by *Phytophthora infestans* [33, pp. 279, 545]. In 1952 up to 80 per cent. of the potatoes were completely destroyed by *Vermicularia varians* [*Colletotrichum atramentarium*: C.M.I. map No. 190].

Sarejanni (J. A.), Démétriadès (S. D.), Zachos (D. G.), & Papaïoannou (A. I.). **Rapport sommaire sur les principales maladies des plantes observées en Grèce au cours de l'année 1952.** [Brief report on the principal plant diseases observed in Greece during the year 1952.]—*Ann. Inst. phytopath. Benaki*, 7, 1, pp. 5–10, 1953.

This report includes the following items [cf. *R.A.M.*, 33, p. 208]. Vines suffered some damage from *Botrytis cinerea* on the island of Rhodes, *Armillaria mellea* was observed on them at Karditsa (Thessaly), and *Rosellinia necatrix* in the south of the Peloponnesus. 'Esca' disease [*Stereum necator*: 29, p. 347] seriously affected vineyards in Arcadia, the island of Leucadia, and in the Patras district, and tumours probably due to *Bacterium tumefaciens* occurred on this crop in the Eleusis district. New foci of infectious degeneration [court-noué: 31, p. 172] were found near Patras, in parts of Epirus, and in Acarnania, both on ungrafted vines and those on American stocks. *Sclerotinia laxa* caused serious losses among cherry trees at Astros and apricot trees near Athens; almond trees in Attica were also affected. *Coryneum beijerinckii* [*Clasterosporium carpophilum*: C.M.I. map No. 188] attacked apricot trees in the Megalopolis district and occurred on almond trees near Athens attacked by *Sclerotinia*. Peach trees on the island of Samos were severely attacked by *Sphaerotheca pannosa* [*R.A.M.*, 19, p. 583]. *Pseudomonas syringae* caused considerable damage to cherry trees near Athens, and attacked apple trees at Kastoria and young pear fruits near Patras. *Deuterophoma tracheiphila* continued to cause serious damage to citrus in northern Peloponnesus and was also found in the region of Astros. Trees double grafted on mandarin above Seville orange were as badly affected as those grafted on Seville orange only. *Sphacelotheca sorghi* [C.M.I. map No. 220] caused serious damage to sorghum at Plati, Macedonia, as did *Piricularia oryzae* [No. 51] to rice at Scala, Laconia, and *Pythium aphanidermatum* [No. 309] to tobacco near Agrinion. The disease caused by the last-named was indistinguishable from that due to *Phytophthora parasitica* var. *nicotianae* in the field. *Pythium aphanidermatum* also severely damaged second-crop potatoes near Thebes. *Phytophthora infestans* [No. 109] caused important losses among spring potatoes at Mallia, Crete, and to autumn crops near Athens, on the island of Lesbos, and in various parts of Epirus. *Sclerotium rolfsii* [No. 311] affected eggplants on the island of Lesbos and in the vicinity of Patras. *Macrophomina phaseoli* [cf. *R.A.M.*, 32, p. 279] caused very serious damage to haricot beans [*Phaseolus vulgaris*] at Boghiati (Attica) and on the island of Tinos. Conditions during the year appeared to be particularly favourable for cucurbit viruses.

Plant diseases.—*Agric. Gaz. N.S.W.*, 65, 9, p. 497, 1954.

New diseases recorded in New South Wales during the six months ending 30th June, 1954, include tomato big bud virus (greening) on Bamboo begonia (*Begonia corallina*), crinkle leaf virus on Eureka, Bellair, Villa Franca, and Lisbon lemon, leaf enation virus on rough lemon [*R.A.M.*, 33, p. 293], *Monochaetia unicornis* on cypress [33, p. 329], *Fusarium orthoceras* var. *gladioli* on *Freesia* [33, p. 211], *Colletotrichum graminicola* on *Holcus mollis*, *Phytophthora erythroseptica* on potato, and *Macrophomina phaseoli* on sorghum.

Plant diseases. Powdery mildew of Wheat. Collar rot of Citrus trees.—*Agric. Gaz. N.S.W.*, 65, 10, pp. 526–531, 5 figs., 1954.

Powdery mildew of wheat (*Erysiphe graminis tritici*) [*R.A.M.*, 33, p. 209] develops rapidly in moist weather, when it may cause appreciable damage. Under the hot, dry conditions, however, which normally prevail in the wheat belt, it is of little economic importance, and control measures are rarely necessary. If a crop becomes rank feeding-off in June or July will reduce the foliage and minimize the

risks inherent in a warm, moist spring. Oats, pasture, or fallow rotations help to control the disease.

Collar rot (*Phytophthora citrophthora*) [33, p. 210] affects the bark of the lower trunk of citrus trees, and sometimes causes brown fruit rot and root rot. It is prevalent in the moist conditions prevailing during the autumn and winter months in coastal districts. Most susceptible to collar rot are Lisbon and Eureka lemons, then in sequence of increasing resistance follow, grapefruit, Washington navel and Valencia orange, and rough lemon; most mandarins are fairly resistant and trifoliata stock immune. Control measures have already been noted in this *Review* [30, p. 310].

[Riley (E. A.).] **Plant Pathology.**—*Rep. Dep. Agric. N. Rhod., 1954*, pp. 23–24, 1955.

In this report [cf. *R.A.M.*, 34, p. 348] it is stated that of 25 fungicides tested in greenhouse conditions against tobacco anthracnose (*Colletotrichum tabacum*) only zineb and captan were satisfactory. Field tests with zineb were conducted in November and December, 1954, and several farmers used it as a routine spray, with highly satisfactory results both in protecting against infection and in checking severe outbreaks. In the Eastern Province, where boron deficiency of tobacco was suspected [cf. loc. cit.], there was some indication of increased yield when borax was applied at 4 lb. per acre. In a farm survey it was noted that the general use of fertilizers containing increased amounts of phosphorus and potash appeared to have reduced the incidence of severe leaf spot of tobacco (*Alternaria* [*longipes*: 34, p. 617]), the best growth with least infection being given by the ratio N.P.K. 1:3:3.

There were no widespread outbreaks of maize rust (*Puccinia polysora*) [34, p. 348], which was recorded only from Petauke, on Southern Rhodesia hybrid; plantings of Hickory King and Namalenga in the vicinity remained largely unaffected. The most serious diseases of maize were blight (*Helminthosporium turcicum*) [20, p. 448], widespread and severe on Southern Rhodesia hybrid and causing premature death of some native types, and streak virus [cf. 34, pp. 83, 448], which caused severe stunting in the Broken Hill and Mukalaikwa areas.

On groundnuts the worst diseases were leaf spot (*Cercospora arachidicola*) [34, p. 348] and rosette virus [loc. cit.], which caused little damage on small plantings, but severely affected many large ones. Local varieties were less affected than Natal Common. Crown rot (*Aspergillus niger*) appeared over a small section of the Pilot Groundnut Scheme, and thiram has been recommended for control trials in 1954–5 [cf. 33, p. 519].

Die-back of limes [34, p. 348] was ascertained to be of virus origin. Virus diseases, especially tristeza [cf. 34, p. 351], are widespread on most species of citrus in Northern Rhodesia, lime and grapefruit being the most susceptible. Double virus streak (tobacco mosaic virus and potato virus X), a serious and disfiguring disease of tomatoes, was recorded for the first time in the Copper Belt. Another virus disease, as yet undetermined, was found on tomatoes near Lusaka, causing ring patterns on the leaves and yellow blotches on the fruits. Collar rot (*Phytophthora citrophthora*) [cf. 30, p. 267] attacked numerous citrus trees in an orchard near Lusaka; scraping the bark and applying Bordeaux paint led to complete recovery.

Voelcker (C. J.). **Annual Report of the Department of Agriculture (Malaya) for the year 1953.**—60 pp., 5 pl., 1 col. map, 1954.

In this report [cf. *R.A.M.*, 33, p. 523] it is stated that about half of 400 cultures of fungi isolated from leaf spots on rice from over 300 nurseries and several hundred fields in most padi growing areas in Malaya were passed through padi-seedlings to be tested for pathogenicity. Over 90 per cent. of the nurseries were affected by leaf spots, mostly *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: 33, p. 141]. The term 'bronzing' covers at least two oil palm discolorations [32, p. 303], a general

yellowing of the pinnae, associated with magnesium deficiency in the fronds, and orange spotting, which may coalesce to cover the pinnae, with low potassium levels. Field application of calcium phosphate seems to increase the absorption of calcium and magnesium by oil palms on sandstone soil while decreasing that of potassium.

On dead and dying parts of cacao plants suffering from die-back *Botryodiplodia theobromae* [cf. 32, p. 303] was often found, but as inoculations with this fungus failed to cause infection, it is concluded that it is too weak to attack healthy plants. A *Fusarium* sp. [32, p. 303] isolated was equally unable to invade healthy tissues. *Fomes noxius* (brown root disease) [cf. 31, p. 9] on cacao was a first record for Malaya. Numerous rotted pods were examined, and fungi associated with the rot were tested for pathogenicity. *B. theobromae*, *Fusarium* sp., and two *Colletotrichum* spp. [cf. 33, p. 412] failed to infect.

Tea suffered from moderate attacks of blister blight (*Exobasidium vexans*) [33, p. 524] in the Cameron Highlands; later intensifications of infection were kept in check by warm, dry weather. In control experiments on a Cameron Highlands estate a yield increase of 11·6 per cent. was obtained in ten months by spraying with copper during recovery from pruning. Red root disease (*Poria hypolateritia*) and *Ustulina zonata* root disease caused a few deaths of tea on a highland estate.

Copper sprays had no effect on a fungus causing stem rot of Manila hemp (identified by the Royal Botanic Gardens, Kew, as *Marasmius subplexifolius*) [cf. 33, p. 723]. Varietal susceptibility varies widely: Tangongon is resistant, Baguisanon susceptible, and Bangulanon very susceptible.

Canker and damping-off of jute are caused by a seed-borne strain of *C. capsicum* [34, p. 577]. Seed treatments with agrosan GN and fernasan were effective; 0·1 per cent. aqueous solution of mercuric chloride gave partial control.

Tomato blight (*Phytophthora infestans*) [32, p. 119] was controlled by perenox and, to a slightly lesser extent, by Bordeaux mixture and SR 406 [captan].

In plantings of carrot in the Cameron Highlands, to observe the effect of leaf blight (*Alternaria dauci*) [33, p. 700] on yield at different times of the year, higher yields were obtained from sprayed plots [fungicide not specified]. In five crops the average increase in yield was 41 per cent. (15·5 to 69 per cent.). In a similar experiment with French beans [*Phaseolus vulgaris*], to discover the best times for spraying against anthracnose (*C. lindemuthianum*) [32, p. 462], yield increases on sprayed plots reached up to 102 per cent.

A mosaic disease of pepper [*Piper* spp.] occurred in Singapore and Perak. The symptoms, yellow mottling and curling of the subnormally small leaves, suggest a virus disease.

Annual Report on the Agricultural Department, Nigeria, 1951–52.—v+76 pp., 1954.

In the section of this report [cf. *R.A.M.*, 33, p. 215] dealing with soil studies (pp. 30–31), H. Vine and J. M. L. Kowal state that the bronzing disease of oil palms, due to potassium deficiency [see preceding abstract and below, p. 719], is also dependent upon the calcium-potassium ratio.

Further investigations on the black pod disease of cacao (*Phytophthora palmivora*) [33, p. 215] by C. A. Thorold (pp. 50–54) are described. Observations showed that the incidence of the disease is not directly affected by tree spacings, but close spacing may be advantageous by inducing the production of fewer pods per tree, and therefore fewer infection foci, and facilitating removal of diseased pods, whilst at the same time maintaining a high yield per acre. On the other hand, control of the disease by spraying is economical only where yields per tree are high, though the tree must not be too tall for adequate coverage. In an experiment started after a visit to Fernando Po, where spray control of black pod is extensively practised, the incidence of the disease was reduced from 50 to 10 per cent. by the application of 1 per cent. carbide Bordeaux mixture at three-weekly intervals.

J. M. Waterston contributes some notes on plant diseases (pp. 55–58) and states that a chlorosis of cacao in the Cameroons, first noted in 1947–8, had spread over an area of 120 sq. miles. The leaves show necrotic symptoms, especially a clearing of the tissues near the secondary veins, often accompanied by reduction in leaf size and marginal crinkle and scorch. Leafless twig disease, characterized by the production of clusters of persistent leaf stipules, giving a 'paintbrush' appearance [13, p. 688], was also found in the Cameroons.

A coco-nut wilt of uncertain origin, resembling a similar outbreak reported in Onitsha in 1917, was observed in Awgu.

Hemileia vastatrix [34, p. 148] was observed on coffee in the British Cameroons, as well as 'black tip', a physiological disorder of Arabian coffee resulting in the death of branch extremities and associated with too rapid temperature changes and absence of shade.

New records for Nigeria are occasional infections of *Puccinia purpurea* on sorghum, *Ustilaginoidea virens* on rice [33, p. 338], and a serious outbreak of red rot (*Colletotrichum falcatum*) [*Glomerella tucumanensis*] on sugar-cane [C.M.I. map No. 186] in the northern region.

Administration Report of the Director of Agriculture Trinidad and Tobago for the year 1953.—70+xi pp., 1954.

On p. 23 of this report [cf. *R.A.M.*, 34, p. 19] it is stated that cacao witches' broom [*Marasmius perniciosus*: 34, p. 353] and black pod [*Phytophthora palmivora*: loc. cit.] were severe in 1953, particularly in wet and low-lying areas. In a programme of compulsory protective action against witches' broom, 25,116 trees were treated by pruning and a few hundred half or fully felled.

Efforts to restrict the virus disease in the Sangre district were continued and 39 trees destroyed. No further spread has occurred but elimination has not been accomplished.

Observations on the dying-out disease of West Indian lime seedlings were continued at the La Réunion glasshouse [34, p. 19]. Seedlings which were branched at an early age showed a discoloured stele, associated with *Fusarium* sp., but no symptoms of the dying-out disease were observed. In comparative pot experiments with two lots of 15 straight, unbranched, healthy seedlings, one planted in virgin soil, and the other in soil which had previously grown healthy lime seedlings, seven seedlings in used soil died after three months as against two in virgin soil. No pathogen was found in the dead plants. This and similar experiences with peaches in the United States suggest that dying-out may be due to plant antagonism and antibiotic relationships. Trials designed to transmit dying-out through the soil or by grafting gave negative results.

Twenty-four plants of a withertip [*Gloeosporium limetticola*]-resistant West Indian lime grown at El Carmen remained free from withertip symptoms.

Miller (P. R.). **Listening Post. 2,4-D injury; Wheat germination; head smut control—reviewed.**—*Agric. Chemic.*, 9, 4, pp. 71–72, 141, 1954.

Injuries to lettuce over wide areas, involving complete loss of crop, in the Salinas Valley of California, was caused by the use of spray machinery previously used for 2,4-D despite three prior rinsings (one alkaline). Symptoms included distorted leaves, failure to form a solid head, and a susceptibility to 'slime mould' due to various causes. Equipment for 2,4-D spraying should not be used for any other purpose.

The information on the reduction of wheat germination by treatment with copper carbonate [*R.A.M.*, 33, p. 414] and control of head smut (*Ustilago bullata*) on *Bromus marginatus* [33, p. 301] has already been noticed from other sources.

KLEIN (DEANA T.) & KLEIN (R. M.). **Transmittance of tumor-inducing ability to avirulent crown-gall and related bacteria.**—*J. Bact.*, 66, 2, pp. 220–228, 3 figs., 1953. [Received 1955.]

Transmissibility of bacterial virulence, as determined by the capacity to induce tumours in susceptible plants (young tomato and *Bryophyllum* plants), was tested at the Department of Botany, University of Chicago, Illinois, using two different strains of *Agrobacterium* [*Bacterium*] *tumefaciens* [*R.A.M.*, 34, p. 215] and other bacterial species. Sterilized, cell-free extracts of bacteria-containing crown-gall tissue, a bactrin prepared by heating a heavy suspension of bacteria at 60° C. for 45 minutes, and nucleic acid produced by and desoxyribonucleic acid isolated from the crown-gall bacteria all caused the strains of *B. tumefaciens*, and *A. rubi*, *A. radiobacter*, and *Rhizobium leguminosarum* avirulent towards certain hosts to become virulent on those hosts. Once acquired, the property of virulence remained genetically fixed.

HEIMBECK (LOUISE S.). **On the etiology of brown roots, yellowing and wilt due to 'B type (Dienes) L. (Kleineberger) forms' of bacteria with special reference to Pea wilt.**—39 pp., 11 figs., 1 map, Oslo, Dreyers Forlag, 1954.

The author believes that pea diseases characterized by root browning, yellowing leaves, and reduced seeding are largely brought about by B type L-forms of bacteria (Dienes *et al.*, *Bact. Rev.*, 15, pp. 245–287, 1951; Kleineberger-Nobel, ibid., pp. 77–103, 15, 1951; Tulasne, *Rev. Immunol.*, 15, pp. 223–251, 1951), arising from certain bacteria that are pleomorphic, and able to exist in several different forms. A synopsis of previous work on L-forms is given and their nature described.

It is considered that fungi and nematodes may afford means of entry and serve as vectors for L-forms, which are extremely sensitive to the presence of certain trace elements, including boron and manganese, and also to mercury. Evidence is adduced to show that L-forms may be seed-borne, may survive in soils, and may follow other parasites, usually entering the vascular system of hosts when the seed is sprouting. Experiments are described indicating that pea wilt [*R.A.M.*, 12, p. 412] is probably due to L-forms.

It is postulated that yellowing and shrivelling are due to the gradual depletion of growth substances by parasitic L-forms heterotrophic for B-vitamins, and the suggestion is made that the transformation of certain bacteria to the L-phase may be induced by commercial fertilizers.

WEBB (R. B.). **A useful bacterial cell wall stain.**—*J. Bact.*, 67, 2, pp. 252–253, 1 pl., 1954.

At the Department of Plant Sciences, University of Oklahoma, Norman, an effective method was developed for staining the outer and cross walls of bacteria and making permanent, dry mounts. An unfixed bacterial smear is left in 5 per cent. tannic acid for one half to one hour, washed, and stained in 0·5 per cent. aqueous crystal violet for 1½ to two minutes. After washing it is flooded with 0·5 per cent. aqueous Congo red for two to three minutes, or longer according to the species, washed, and blotted dry.

ORELLANA (R. G.). **Need for quarantine regulations for Cacao introductions.**—*Cacao* (*Int.-Amer. Cacao Cent.*), 3, 1, p. 2, 1954.

The author warns against the increasing danger of spreading cacao diseases with the more frequent interchange of cacao seeds, seedlings, cuttings, and budwood between countries and continents, and strongly urges the need for effective quarantine measures, at present inadequate or lacking in many countries, to prevent disease introduction and yet permit valuable material to reach the growers.

Van Suchtelen (N. J.). **Topsterfte bij Cacao in de kwekerij.** [Top die-back of Cacao in the nursery.]—*Surinaam. Landb.*, 3, 3, pp. 223–224, 1955. [English summary.]

Phytophthora [*palmivora*] has long been known as an agent of wilting of the young fruits, brown rot of older ones, and canker of the stem and branches of cacao in Surinam [*R.A.M.*, 6, p. 603; 8, p. 527], but a *P.* sp. has only recently been observed causing die-back of nursery plants in the shade tents of the Cacao Propagation Centre at Paramaribo.

Andersen (H.). **Species of Helminthosporium on cereals and grasses in Denmark.** —*Friesia*, 5, 1, pp. 80–89, 2 figs., 1955.

Of the eight graminicolous species of *Helminthosporium* comprised in this annotated list (which is preceded by a key), *Helminthosporium sativum*, *Pyrenophora bromi* on *Bromus arvensis*, *P. tritici-repentis* on *Agropyron repens*, *P. lolii*, and *H. dematioideum* are reported from Denmark for the first time. *P. avenae*, causing leaf blotch of oats, is very common but tends to be overlooked [*R.A.M.*, 34, p. 346]. *H. gramineum* and *H. teres*, the agents of barley stripe and net blotch, respectively, have become very rare since seed disinfection was adopted as a general practice.

Hosts of *H. sativum* are *A. repens*, *Festuca pratensis*, *F. rubra*, barley, *Lolium multiflorum*, *L. perenne*, oats, *Dactylis glomerata*, and wheat. *P. lolii* has been collected on *L. multiflorum*, *L. perenne*, *F. pratensis*, *F. rubra*, *Phleum pratense*, *Poa pratensis*, and *P. trivialis*, and *H. dematioideum* on *D. glomerata* and *F. duriuscula*.

Bulger (R. O.). **Barberry eradication.**—*Agric. Chemic.*, 9, 6, pp. 60–61, 147, 3 figs., 1954.

The author reviews the history of the eradication campaign in the United States [cf. *R.A.M.*, 18, p. 165] against the European barberry (*Berberis vulgaris*) and the native Allegheny (*B. canadensis*) and Colorado (*B. fendleri*) barberries, with special reference to the introduction of the newer types of herbicides such as MCPA, 2,4,5-T, and 2,4-D. It is pointed out that barberry eradication alone has not controlled stem rust, but combined with plant breeding it has resulted in a noticeable reduction in crop losses. For instance, farmers report an increase in yield of oats in Pennsylvania of 123 per cent. and of wheat in Virginia of 68 per cent. The serious outbreak of stem rust following the appearance of race 15B of *Puccinia graminis* emphasized the danger of the barberry, on which new physiologic races originate, and also the need of a suitable fungicide for use in such an emergency, where plant-breeding methods are of little avail.

Co-operative eradication campaigns are conducted in 18 States, producing 2,000,000,000 bush. of cereals on 75,000,000 acres. So far, the average cost of barberry eradication has been about five cents per bush of the 448,000,000 destroyed.

Allen (P. J.). **The role of a self-inhibitor in the germination of rust uredospores.** —*Phytopathology*, 45, 5, pp. 259–266, 9 graphs, 1955.

At the Department of Botany, University of Wisconsin, uredospores of *Puccinia graminis* from wheat floated on dilute potassium phosphate buffer solutions at or below pH 7 for eight to 24 hours under aerobic conditions produced at least one substance which was highly active in the prevention of further uredospore germination. The activity of crude solutions of the inhibitor was reduced by aeration at pH 6 but not at 7·3, retained on heating to 100° C. in a sealed container, and destroyed by exposure to glass surfaces. The effect of inhibitor solutions on pre-floated spores was not appreciably modified by the potassium phosphate concentration or oxygen tension, but it increased with rising pH above 6 and decreased with an increase in carbon dioxide tension up to at least 2·5 per cent.

The germination of untreated (as opposed to pre-floated) uredospores was stimulated by the addition to the buffer solutions of dinitrophenol, methyl naphthoquinone, and coumarin, the optimum concentration rising with increasing quantities of spores. The same compounds overcame the activity of inhibitor solutions in the prevention of germination. It was shown that the action of dinitrophenol is not dependent on the formation of a dinitrophenol-inhibitor complex in the medium.

It is concluded that irregularities in the germination of uredospores of *P. graminis* are largely explicable in terms of the self-inhibitor secreted in aqueous solutions. They can be counteracted by an appropriate pre-floating treatment, whereby spores may be obtained which will germinate in a consistent and predictable manner.

[DE] URRIES (M. J.). **Acerca de una podredumbre de las raíces, que este año afectó gravemente a algunos sembrados de cereales.** [Concerning a root rot which seriously affected some cereal crops this year.]—*An. Inst. bot. A. J. Cavanilles* (formerly *An. Jard. bot. Madr.*), 12 (1, *1953*), pp. 233–246, 7 figs., 1954. [English summary.]

Wheat and barley crops in certain parts of the Toledo and Teruel provinces of Spain suffered severe damage [? during 1953] from a dry rot of the roots and stem bases. The pathogenicity of various species isolated from the diseased tissues, including *Fusarium culmorum* [*R.A.M.*, 4, p. 403; 13, p. 759] and *Helminthosporium sativum* [9, pp. 30, 121], was established in inoculation experiments. The plants attacked had probably been weakened already by adverse soil and climatic conditions. In Teruel the outbreak is believed to have originated from infected seed. Samples plated on agar yielded species of *Fusarium*, *Helminthosporium*, and *Alternaria*; in one sample internal mycelium was carried in 80 per cent. of the seeds.

[DE] URRIES (M. J.). **Efecto de la temperatura en el tipo de reacción de las variedades diferenciales inoculadas con varios aislamientos de P. rubigo-vera tritici.** [Effect of temperature on the reaction type of differential varieties inoculated with various isolates of *P. rubigo-vera tritici*.]—*An. Inst. bot. A. J. Cavanilles* (formerly *An. Jard. bot. Madr.*), 12 (1, *1953*), pp. 247–263, 5 graphs, 1954. [English summary.]

The results obtained [in Spain] by incubating differential wheat varieties inoculated with eight monospore cultures of *P*[*uccinia*] *rubigo-vera tritici* [*P. triticina*: *R.A.M.*, 34, p. 88] at six different temperatures from 8° to 24° C. generally confirmed those of earlier work [19, p. 463]. The susceptibility of Brevit, Carina, Loros, and Hussar increased with the temperature, particularly in the last-named, but Democrat and Webster [30, p. 561] became more resistant as the temperature was raised. Generally the resistance of Mediterranean was little affected but occasionally it increased as the temperature rose. Some differences between the isolates were noted, mostly in the position of the cardinal temperature points or the measure of the response.

There is no reason to exclude Brevit from the differential varieties on the basis of these tests. Democrat, however, gave inconsistent results and was affected by temperature to a great extent.

SCHROEDER (H. W.). **Antagonistic action of Helminthosporium sativum and Gibberella zeae to infection by Tilletia spp. causing bunt of Wheat.**—*Phytopathology*, 45, 5, p. 288, 1955.

The results of greenhouse tests in 1952–3 and of a field trial in 1954 at the Minnesota Agricultural Experiment Station confirmed previous observations that the joint inoculation of wheat seed with the agents of root rot, *Helminthosporium*

sativum and *Gibberella zeae*, and of bunt (*Tilletia* spp.) may prevent the development of adequate infection by the latter for the purpose of disease ratings. Thus, in the field planting the presence of root rot inoculum in the seed reduced the incidence of bunt in mature heads of the II–46–13, Ulka, and Lee varieties by 78, 64, and 61 per cent., respectively. Grading for root rot and bunt should therefore be carried out separately.

Sill (W. H.). **Some characteristics of the Wheat streak-mosaic virus and disease.** —*Trans. Kans. Acad. Sci.*, 56, 4, pp. 418–424, 1953. [Abs. in *Biol. Abstr.*, 28, 9, p. 2177, 1954.]

Studies at Kansas State College, Manhattan, demonstrated that in order to induce severe damage on wheat by streak mosaic virus [*R.A.M.*, 34, p. 588 and next abstract], wheat plants must be inoculated when young. Infective virus was not obtained from leaves of dead plants and seldom from brown leaves of living plants. Dead infected wheat plants, stubble, and wheat refuse did not serve as oversummering or overwintering virus repositories, but leaves from dormant, overwintering, virus-infected wheat plants consistently contained infective virus.

Sill (W. H.) & Connin (R. V.). **Summary of the known host range of the Wheat streak-mosaic virus.**—*Trans. Kans. Acad. Sci.*, 56, 4, pp. 411–417, 1953. [Abs. in *Biol. Abstr.*, 28, 9, p. 2177, 1954.]

A summary is given of all known hosts of wheat streak mosaic virus [see preceding abstract], including naturally infected grasses found in Kansas, South Dakota, and Colorado. Wheat is the only crop plant so far reported as naturally or seriously infected in the field. The oversummering grasses known to be naturally susceptible are distributed widely enough throughout the present mosaic area of Kansas to provide, if adequately infected, autumn virus sources for the inoculation of each new wheat crop by any vector present.

Podhradszky (J.) & Király (Z.). **Ustilago nigra Tapke (black loose smut of Barley) in Hungary.**—*Növénytermelés*, 3, 1–2, pp. 123–128, 5 figs., 1954. [Hungarian, with English, German, and Russian summaries.]

The discovery of *Ustilago nigra* [cf. *R.A.M.*, 33, p. 527] on barley in Hungary during 1953 constitutes the first European record of this pathogen. Examination of a large number of spores of *U. hordei* and *U. nigra* led the authors to conclude that natural hybridization may occur between them.

Simons (M. D.), Peturson (B.), & Murphy (H. C.). **Purification of differential Oat varieties for identification of races of crown rust.**—*Plant Dis. Reptr*, 39, 1, pp. 23–24, 1955. [Multilithed.]

In co-operative investigations by the United States Department of Agriculture, Iowa Agricultural Experiment Station, and the Cereal Division, Department of Agriculture, Canada, pure lines of each of the ten new differential oat varieties used for identification of races of crown rust (*Puccinia coronata*) [*R.A.M.*, 34, p. 363 and next abstracts] were established from the existing impure stocks and increased to serve as a common foundation stock for all pathologists. Selected seed will be available after the autumn of 1955 upon request from the senior author.

Simons (M. D.). **Adult plant resistance to crown rust of certain Oat selections.**— *Phytopathology*, 45, 5, pp. 275–278, 1955.

About 40 lines of oats showing adult-plant resistance to crown rust (*Puccinia coronata*) were selected from a preliminary field test at the Iowa Agricultural Experiment Station in 1953 [*R.A.M.*, 34, p. 31 and preceding and next abstracts]. In greenhouse tests during the following winter 27 of these selections were susceptible to race 202 of the rust in the seedling stage. Tested again at heading, both the

upper and lower leaves of some plants were resistant, only the lower on others, and four lines showed no resistance.

In 1954 successive plantings of the 27 lines were timed in such a way that their reactions to crown rust in the first-leaf, tillering, heading, and soft-dough stages of growth could be determined simultaneously. All proved to be susceptible in the first-leaf stage. In general, those which showed an appreciable degree of resistance in the two later stages were also resistant at tillering. Several lines that were classified as resistant or highly resistant in the field in 1953 were susceptible in 1954. The three selections with the maximum degree of resistance at maturity were P.I. Nos. 174544, 174545, and 185783, followed by Nos. 189628, 190584, 193040, 197278, and 197279.

The correlation between the responses of adult plants in the field and of those at the heading stage in the greenhouse was complicated by the variation in susceptibility of different leaves of the greenhouse plants. However, where the upper leaves withstood infection in the greenhouse, the selections were uniformly resistant in the field.

FINKNER (V. C.). **Genetic factors governing resistance and susceptibility of Oats to Puccinia coronata Corda var. avenae, F. & L., race 57.**—*Res. Bull. Ia agric. Exp. Sta.* 411, pp. 1040–1063, 1 col. pl., 8 figs., 1954.

At the Iowa Agricultural Experiment Station the inheritance of resistance and susceptibility of oats to crown rust, *Puccinia coronata* [see preceding abstracts], was investigated by examining the F_2 data from 23 crosses involving eight major sources of resistance from the varieties Klein 69 B, Landhafer, Victoria, Santa Fe, Ukraine, Trispernia, Anthony-Bond × Boone, and Clinton (susceptible).

The resistance of Victoria is distinct from the other types but no support was given to the hypothesis that this is a hypersusceptible reaction. The genotype of Santa Fe varied for rust resistance, but those of Landhafer and possibly also the Anthony-Bond × Boone parents were consistent in their reaction. Ukraine was assumed to have two duplicate linked factor pairs controlling resistance to *P. coronata* race 57 and a crossover value of 23 per cent. was estimated from Ukraine × Clinton. Most of the crosses involving Clinton indicated that this variety carried only the recessive alleles to resistance factors.

This study revealed that at least eight genes at five loci are involved in determining resistance to one race of crown rust. It is concluded that the potential genetic variation in oats is great enough to combat changes in races by continually breeding new resistant varieties.

ST. GARAY (A.). **Untersuchungen über die Beziehungen zwischen Mutterkorn (Claviceps purpurea Kühn) und Roggen (Secale cereale L.).** [Studies on the relations between ergot (*Claviceps purpurea* Kühn) and Rye (*Secale cereale* L.).]—*Naturwissenschaften*, 42, 14, p. 422, 1955.

Studies are reported from the Medicinal Plant Research Institute, Budapest, Hungary, on the physiological effects of the Magyar 12 strain of *Claviceps purpurea* on Lovasz patona rye [cf. *R.A.M.*, 34, p. 638]. The reducing sugar (determined by Bertrand's method) and total nitrogen (Kjeldahl) contents and respiratory intensity (measured by the Warburg apparatus) remained unchanged in infected ears. On the other hand, the diseased ears (tested by a recent German indicator method) did not assimilate, while their peroxidase activity rose by 20 to 30 per cent. and that of catalase sank by 35 to 40 per cent., as determined by a new Russian procedure.

The germination of rye in Petri dishes was markedly inhibited in the presence of a fairly high concentration of an extract prepared from 25 gm. ground ergot with 100 ml. distilled water, boiled for five minutes. The retardation of growth of

the rye coleoptiles was accompanied by a rise in respiration and in peroxidase and catalase activity, whereas that of saccharase fell. It was found that the toxic substance disappeared from the sclerotia during the formation of fruit bodies, in which it collected until their content was twice as high as that of the sclerotia. The above reactions indicate that toxin production is a feature of the parasitic habit. Although the several strains of ergot contain different amounts of the inhibitory factor, all those tested were equally aggressive on different varieties of rye.

Huffman (M. D.). **Disease cycle of Septoria disease of Oats.**—*Phytopathology*, 45, 5, pp. 278–280, 8 figs., 1955.

The use of spore traps at the Iowa Agricultural Experiment Station demonstrated the participation of at least two types of spores in the establishment of infection by *Leptosphaeria avenaria* on oats [see next abstract]. Microspores [*R.A.M.*, 32, p. 248], not hitherto reported as occurring in the field, were disseminated in profusion during June from overwintered stubble and were detected by means of spore traps. They formed the principal source of primary inoculum. The initiation of the black-stem phase, some 10 to 12 days after the development of leaf-spotting, was effected by water dissemination of the macroconidia formed in macropycnidia in the foliar lesions.

Huffman (M. D.). **Testing for resistance to the Septoria disease of Oats.**—*Plant Dis. Reptr*, 39, 1, pp. 25–28, 3 figs., 1955. [Multilithed.]

In experiments carried out at the Iowa Agricultural Experiment Station, Ames, in 1953 and 1954 to detect sources of resistance in oats to *Leptosphaeria avenaria* [*R.A.M.*, 33, p. 476 and preceding abstract] a method was developed for producing the necessary quantities of spores, which are considered to be the best type of inoculum. Sterilized oat stems suspended in distilled water were inoculated and the few pycnidia produced crushed in sterile water. The spore suspension was poured over a medium consisting of pulverized or ground green oat leaves (300 gm.), 100 ml. distilled water, and 12 to 15 gm. agar. Abundant sporulation could then be maintained in successive cultures on this medium provided all transfers were made by spores and not by mycelium.

Inoculum was applied in the greenhouse with a hand atomizer and in the field with a Hudson Junior knapsack sprayer. Infection was obtained in the greenhouse after a 12-hour incubation period in a moist chamber at 60° to 70° F. In the field, where inoculation coincided with the dew period, typical leaf spot symptoms developed within a fortnight. Twenty-four C.I. selections were found to be significantly more resistant than the commercial varieties used in the north-central States, the percentage leaf area covered by lesions ranging from 10 to 27 as against 46 for the susceptible Cherokee.

Kišpatić (J.) & Lušin (V[era]). **Prašna snijet Kukuruza.** [Head smut of Maize.]—*Zasht. Bilja* (*Plant Prot., Beograd*), *1954*, 25, pp. 3–17, 1954. [English summary.]

Further investigations on maize head smut (*Sorosporium reilianum*) [*Sphacelotheca reiliana*: *R.A.M.*, 33, p. 291] at the Faculty of Agriculture and Forestry and the Institute for Plant Protection, Zagreb, Yugoslavia, showed that soil temperature and moisture are the most important factors in determining the degree of infection. Seedlings from 0·5 cm. in length were found to be at the stage most suitable for fungus penetration, infection not having been noticed on mature plants. Dusting the seed with various mercurial disinfectants [34, p. 134] did not entirely control infection by soil or seed-borne chlamydospores, indicating the importance of removing infected ears to reduce soil infestation, and of breeding of resistant varieties.

Cox (R. S.) & Wolf (E. A.). **A crown rot of Sweet Corn caused by Helminthosporium turcicum.**—*Phytopathology*, 45, 5, pp. 291–292, 1 fig., 1955.

A sudden foliar wilting of maize followed by the death of the plant within two to five days and accompanied by a darkened area at the base of the stalk, sometimes extending upwards through the second node and restricted initially to the vascular bundles and not infecting the roots, in nursery plots in Florida was due to *Helminthosporium turcicum*, which produced typical symptoms of northern leaf blight on inoculation back to the leaves and crown of maize (*Phytopathology*, 12, p. 30, 1922).

Del Rosario (Maria S. E.). **The fungus causing black kernel rot of Corn.**—*Philipp. Agric.*, 37, 10, pp. 623–631, 6 figs., 1954.

A black kernel rot was observed on maize ears at the Department of Agronomy, College of Agriculture, Laguna, Philippines, in February and November, 1953. It commenced as a brown discoloration of the kernels, which later turned black with small eruptions, and ended in total invasion and dry rot. In severe cases the cob was affected. *Botryodiplodia theobromae* or a closely related species was isolated on maize meal agar and sub-cultures were used to establish pathogenicity. Symptoms developed within two days of spraying week-old maize seedlings with a pycnospore suspension, or smearing the leaves with a fragment of an agar culture. The leaf lesions were round and watersoaked at first, becoming dark brown and elongated or oval, finally straw-coloured at the centre with a dark brown border and measuring 2 to 4 by 0·5 to 1 cm. Dehusked, semi-mature maize ears inoculated similarly turned brown after three days and produced fruiting bodies after a week. Of 45 maize seeds sprayed with a pycnospore suspension and set in sterilized soil only three germinated; the rest were attacked by *B. theobromae* and partially rotted. Of 45 disinfected seeds sown in infested soil only seven germinated, the rest being invaded by the fungus. Infection developed readily in inoculated cacao pods.

Hemingway (J. S.). **Effects of Puccinia polysora rust on yield of Maize.**—*E. Afr. agric. J.*, 20, 3, pp. 191–194, 1955.

A study of the incidence of *Puccinia polysora* on maize plantings in the Nachingwea area, in the Southern Province of Tanganyika [*R.A.M.*, 34, p. 577], showed that initial infection occurs at progressively earlier stages on later plantings, spreading from adjacent established epidemics. Once the plants are infected, however, the rate of increase in any planting is uniform. The aim of any agronomic system of control should be, therefore, to delay the initial incidence of the disease, and this can be achieved by not making small plantings in advance of the main crop.

The bushel weight of the variety Katambili was reduced by the disease from 60·7 lb. (sulphur-dusted at four-day intervals) to 57·9 lb. and the seed per acre from 2,749 to 1,847 lb. December-sown crops yielded 61·1 and 60·4 lb. per bush. and 2,625 and 2,470 lb. seed per acre compared with the heavily rusted February sowings, for which the figures were 55·6 and 54 and 859 and 678 lb. The reductions result from the decrease in cobs per plant and from a considerable reduction in individual seed weight. The rust has no effect on the carbohydrate-protein ratio in the seed.

Chapot (H.). **L'agrumiculture au Liban et en Syrie.** [Citrus cultivation in Lebanon and Syria.]—*Fruits d'outre mer*, 8, 8, pp. 393–402, 14 figs., 1 map, 1953.

Citrus in Lebanon is attacked by *Phytophthora parasitica* [*R.A.M.*, 32, p. 620] and *Fusarium solani* [33, p. 226], the latter producing gummosis of the leaves and buds. Lemons are occasionally subject to mal secco (*Deuterophoma tracheiphila*) [23, p. 252]; psorosis is often associated with important trunk gummoses,

and exanthema [copper deficiency: 32, p. 429] has occurred but was reduced by copper sulphate sprays.

VERNEAU (R.). **Le Phytophthora parasite degli Agrumi nella Campania.** [The *Phytophthora* species parasitic on Citrus in the Campania.]—*Ann. Sper. agr.*, N.S., 8, 1, pp. 133–162, 2 pl., 5 figs., 1 graph, 1 map, 1954. [English summary].

A full account is given of studies conducted at the Experimental Laboratory of Plant Pathology, Portici, Italy, on the morphological, cultural, and biological characters and pathogenicity of some 650 isolates of *Phytophthora* found on citrus fruits picked from October to June in different parts of the Campania. In the coastal region near Amalfi the most dangerous species appeared to be *P. syringae* [cf. *R.A.M.*, 31, p. 256]. In the peninsula of Sorrento the only species found was *P. hibernalis* [cf. 31, pp. 563, 604; C.M.I. map No. 47]. A dangerous species, identified as a dissociant, sterile form of *P. syringae*, was found in Naples and the vicinity, as was a heterothallic form of *P. palmivora* [cf. *R.A.M.*, 27, p. 159; 31, p. 326]. *P. syringae*, *P. hibernalis*, *P. cactorum* [cf. 23, p. 184; 27, p. 129], and a dissociant form of *P. syringae* were isolated from fruits grown in the province of Salerno. All the species except *P. palmivora* were very virulent and in seasons favouring infection were a potential cause of heavy losses. *P. syringae*, *P. hibernalis*, and *P. cactorum* have not before been recorded as parasitic on citrus fruits in Italy.

FABRICATORE (JOLANDA A.). **L'antracnosi dell'Arancio.** [Anthracnose of Orange.] —*Ann. Sper. agr.*, N.S., 8, 1, pp. 283–286, 1 fig., 1954. [English summary.]

Oranges received at the Plant Pathological Station, Rome, bore dry, brown spots at the base, in which the pericarp was reduced in thickness and adhered tenaciously to the internal tissues, which were softened below the lesions. The affected parts yielded *Colletotrichum gloeosporiodes* [*Glomerella cingulata*: *R.A.M.*, 29, p. 616; 33, p. 720], not previously isolated from orange fruits in Italy. Inoculations of oranges under glass bell jars gave positive results.

TINDALE (G. B.) & PEGGIE (I. D.). **Storage behaviour of Washington Navel Oranges.**—*J. Dep. Agric. Vict.*, 53, 7, pp. 317–325, 2 figs., 3 graphs, 1955.

During 1953 experiments were made in Victoria to confirm previous findings [*R.A.M.*, 32, p. 310] concerning the effect on the storage behaviour of Washington Navel oranges from the Mildura district of Victoria of (*a*) maturity at picking time, (*b*) storage temperature, (*c*) use of a fungicidal dip and (*d*) a fungicidal wrap, before storage, and (*e*) growing conditions. The results demonstrated that stored Navels are very susceptible to early attack by *Penicillium* moulds [*P. italicum* and *P. digitatum*: 34, p. 448], which are almost completely controlled by dipping the fruit in a fungicidal dip (brytene wax, 1 in 3 vols. water, plus 4 per cent. borax and 2 per cent. boric acid) or by wrapping them in diphenyl wraps (containing between 6 and 40 mg. diphenyl per 10 in. wrap), both before storage [cf. 34, p. 642].

Navels are subject to various disorders (browning, gooseflesh, yellowing, and skin breakdown) if stored at low temperatures, their susceptibility depending on the degree of maturity. June-picked fruits store best at 45° F. and July- to August-picked fruits at 40°. Storage disorders developed in early, mid-season, and late-picked oranges after 1½ months at 35° and after two weeks at 32°, followed by heavy mould wastage. Even if no disorders develop storage life is limited by loss of flavour prior to the onset of mould attack. Early-picked fruit stored longest (three months) at 45°, mid-season at 40°, and late-picked at 40° (two months).

A shipping temperature of 40° is advocated during transit to England, while 35°, which ensures better control of early mould attack while the storage period is insufficient for disorders to develop, is preferable for export to New Zealand or the East or for local storage up to six weeks.

Calavan (E. C.) & Weathers (L. G.). **Fungi and shell bark of Lemon.**—*Calif. Agric.*, 8, 6, pp. 10–11, 2 figs., 1954.

From advancing margins of shell-bark [cf. *R.A.M.*, 27, p. 183] lesions on lemon trees in ten Californian orchards the following fungi were isolated: *Alternaria*, *Botrytis*, *Cephalosporium*, *Cladosporium*, *Colletotrichum*, *Diplodia*, *Dothiorella*, *Fusarium*, *Penicillium*, *Phoma*, and *Phomopsis*, as well as other fungi and a number of bacteria.

In April, 1952, 41 seventeen-year-old lemon trees near Oxnard, four miles from the coast, all with shell bark, were inoculated each with *Botrytis cinerea*, *Diplodia natalensis*, *Dothiorella gregaria* [*Botryosphaeria ribis*], and *Phomopsis* [*Diaporthe*] *citri*. The lesions enlarged rapidly through July, then more slowly, and mostly ceased to grow by late summer. The largest lesions were caused by *Botrytis*, and gummosis occurred near lesions infected by *Botryosphaeria ribis* and *Botrytis*. Fungi used in the inoculations were recovered in July. One year after inoculation separation layers of cork had formed in the bark beneath the lesions in all *Diaporthe* lesions, and in 50 to 83 per cent. of lesions from other fungi.

Control of small shell bark lesions by the use of fungicides is probably impossible because many such lesions develop without the presence of fungi. The best and cheapest control is the use of resistant varieties, such as the Lisbon types Monroe and Prior, on good rootstocks.

Turrell (F. M.) & Weber (J. R.). **Elemental sulfur dust, a nutrient for Lemon leaves.**—*Science*, 122, 3159, pp. 119–120, 1 fig., 1955.

Citrus growers in California have observed that trees dusted with elemental sulphur produced more first-grade fruit than non-dusted trees. The leaves on one side of a number of Y-branches on the shady side of Eureka lemon trees were covered with cellophane bags; the leaves on the other twig being dusted on both surfaces with elemental S_{35} and also covered. Analyses showed that the sulphur had penetrated the leaf and also entered the metabolic stream and been synthesized into protein. S_{35} was also found in the non-dusted, covered leaves. The specific activity of sulphur in the protein of these leaves was low or negligible, but that of barium sulphate was significant when obtained from the protein ash, and ten times more so when obtained from water extracts of leaves. This suggests that sulphur is transported from the site of the dust to other locations in the plant as inorganic sulphate and as such is available for nutrition of the tree.

Southwick (R. W.). **Micro-element deficiencies in Citrus orchards.**—*Calif. Citrogr.*, 39, 12, p. 448, 1954. [Received 1955.]

In citrus orchards in San Bernardino county, California, zinc deficiency [*R.A.M.*, 30, p. 414] is widespread and relatively severe as the warm season ends. The basic spray formula for control is 1 lb. zinc oxide or 5 lb. zinc sulphate plus 2½ lb. hydrated lime (or soda ash) per 100 gals. water.

Deficiency of manganese [cf. 34, p. 91] in San Bernardino county is not nearly as important as zinc deficiency; but symptoms do occur, and it costs little to add the necessary 1 lb. manganese sulphate per 100 gals. of water; for lemon trees ½ lb. is safer.

Pereau-Leroy (P.). **Variétés de Dattier resistantes à la fusariose.** [Varieties of Date Palm resistant to fusariosis.]—*Fruits d'outre mer*, 9, 10, pp. 450–451, 1954.

Of several varieties of date palm selected in Morocco for resistance to 'bayoud' (*Fusarium albedinis*) [*R.A.M.*, 29, p. 301; 33, p. 228] none equalled Deglet-Nour, Mehjoul, or Bou Feggous in appearance, flavour, or keeping quality though the fruits of Takerboucht and Bou Ijjou weighed 10 to 15 gm., had an acceptable

flavour, kept fairly well, and would be of satisfactory dessert quality on the European market. Since these, Bou Zeggar, and Taabdount are grown only in small numbers or in areas of comparatively recent infection they can be only considered highly resistant as yet. Bou Stammi, Iklane, and Taadmamt have remained uninfected in old bayoud plantings and are considered immune. Amira and Ti-n-Naceur, cultivated in Algeria, are occasionally attacked and correspond in degree of susceptibility to the Moroccan varieties Bou Sliken and Bou Ittob. A trial is under way to test the above varieties in their own particular environments.

WATERSTON (J. M.). **Observations on the influence of some ecological factors on the incidence of Oil Palm diseases in Nigeria.**—*J.W. Afr. Inst. Oil Palm Res.*, 1, pp. 24–59, 12 pl., 1953.

Following the discovery of *Fusarium oxysporum* causing wilt disease of oil palms in the Belgian Congo, a preliminary disease survey was carried out in Nigeria in 1948 [*R.A.M.*, 30, p. 24]. The chief diseases of the palm in Nigeria and the Cameroons are due to nutritional deficiencies, the commonest being Nkwele yellows [28, p. 394] or orange spot [confluent orange spotting: see next abstract]. Other diseases are associated with species of *Ganoderma*, chiefly *G. lucidum* [cf. 34, p. 644], and *Fusarium oxysporum* [28, p. 394; 30, p. 24].

The author is of the opinion that fresh-water swamp forest is possibly the natural home of the oil palm in Nigeria, and here it is free from disease. He considers that elsewhere in the forest region it is a cultigen, occurring in two contrasting types of habitat, viz., homestead and farmland. The former enjoys fire protection and contains the healthiest palm, whereas the latter may suffer degradation resulting from the pressure of population on the land. The relationship of disease and environment is discussed, together with the implications of breeding for commercial plantations. The paper concludes with a comprehensive check list of fungi recorded on oil palm and an extensive list of references.

BULL (R. A.). **A preliminary list of the Oil Palm diseases encountered in Nigeria.**—*J. W. Afr. Inst. Oil Palm Res.*, 2, pp. 53–93, 18 pl. (5 col.), 1954.

This paper contains a full account of the diseases of the oil palm as they are known in Nigeria today [see preceding abstract] and their distribution, based on observations made over 20 years by various workers and on the writer's own studies. Attention is given to synonymy, a key is included to facilitate field identification, and the paper is well illustrated. In section I, nutrient deficiency diseases [cf. *R.A.M.*, 32, p. 77] are discussed, including orange frond disease, due to magnesium deficiency [see next abstract], in which the discoloration spreads throughout the leaflets; confluent orange spotting, apparently due to potassium deficiency, with the discoloration confined to certain areas of the lamina, being the commonest disorder of the oil palm [22, p. 248 and above, p. 708]; and a complex condition arising when both these deficiencies occur together. The confusing synonymy that has arisen in past descriptions of these diseases is clarified by listing the various names that have been applied to both. Finally, an account is given of the obscure condition recorded by Wardlaw as 'plant failure' [33, p. 80], in which genetic factors may be involved, affecting susceptibility to nutrient deficiencies.

Section II deals with four types of leaf chlorosis, viz., 'patch', 'streak', 'mottled', and 'general', which are of minor account and are not necessarily nutritional in origin. This is followed by a section on stem diseases, of which vascular wilt (*Fusarium oxysporum*) [see preceding abstract] is potentially the most serious, though as yet of limited distribution in Nigeria. *Ganoderma* trunk rot is widespread in native palmeries, but chiefly affects palms over 20 years of age. *G. lucidum* [loc. cit.] is commonly associated, but *G. colossus* and *G. applanatum* have

been reported. The taxonomy of the genus is still uncertain [34, p. 450]. Basal decay causes a wet rot of the stem and the death of the crown of young palms. Although at one time attributed to *Ganoderma* spp., the author considers it unlikely that this is the true cause, which remains uncertain.

Leaf diseases caused by fungi are dealt with in section IV. Patch yellows, involving a progression of symptoms that includes a 'target spot' stage and a subsequent 'shot-hole' effect, is associated with various species of *Fusarium*. *Pestalotia* spp. and *Helminthosporium* spp. appear regularly in isolations from orange leaf blotch. Crusty spot and necrotic spotting are suspected to be of fungal origin but are of no economic importance. *Cercospora elaeidis* [cf. 34, p. 643] has been reported to be the cause of freckle, but although conidiophores of *Cercospora* sp. are invariably associated with lesions, no success has attended efforts to isolate the fungus in culture. Freckle is a severe disease of oil palm seedlings that may cause considerable set-back in nurseries, though not often lethal. Anthracnose, another seedling disease of unknown fungal origin [loc. cit.], is frequently severe in nursery trays and beds.

Section V, concerning root diseases, deals entirely with the complex seedling disease 'blast', of unknown origin, which often results in severe losses in nurseries. A number of fungal parasites have been isolated from affected roots.

Fruit and bunch diseases are not serious, and such as there are fall into three classes, viz., fruit rot, affecting individual fruits, bunch end rot, involving decay of the distal end of the bunch, and bunch stalk rot. A number of fungi are listed as having been found associated with these conditions.

The last section (VII) deals with miscellaneous diseases of undetermined origin, of which the most important is little leaf [33, p. 672], arising from the death of the central spear and subsequent production of abnormal leaves. It is, however, less severe in Nigeria than in the Belgian Congo. The causes, which may not always be the same, that bring about this condition are as yet unknown. Leaf-base wilt has only been observed in the Calabar area, usually appearing in 12- to 16-year-old palms, and only during a female flowering cycle. It involves the bending down of fronds with a fruit bunch in the axil, the bunch often failing to mature. The cause may be partly genetic and is apparently physiological.

In crown disease, possibly associated with *Marasmius* sp., the young unfolded leaflets of newly expanded leaves show watersoaked patches. It occurs frequently in young Deli palms in Nigeria, but not as a rule in wild groves.

Bull (R. A.). **Studies on the deficiency diseases of the Oil Palm. I. Orange frond disease caused by magnesium deficiency.**—*J. W. Afr. Inst. Oil Palm Res.*, 2, pp. 94–129, 10 pl. (7 col.), 1 diag., 1 graph, 1954.

Orange frond disease of oil palms in Nigeria [see preceding abstract] is first evident in the leaflets as olive or ochre patches (between two adjacent lateral veins), which become brighter yellow and finally deep orange as their size increases. Typically, the symptoms first appear 4 in. or so from the tip of the leaflet and the yellow colour fades away towards the base. The symptoms of confluent orange spotting [see preceding abstracts] are shown to be distinct. Eventually the orange patches are invaded by secondary fungi and turn brown and necrotic, from one-third to one-half of the crown often being killed in this way. *Pestalotiopsis gracilis* was shown to be actively pathogenic to leaves in the later stages of orange frond disease and other fungi may be involved.

Extensive injection trials into the cut ends of leaflets were carried out in 1952 and 1953 with all the essential mineral elements and showed clearly that the disease was due to magnesium deficiency. Corroborative evidence as to the effect of magnesium was also obtained by spraying and fertilizer trials. The magnesium status of healthy as opposed to diseased leaves and its influence on the severity of

symptoms is discussed in detail. There is no direct correlation between magnesium content and severity of symptoms, and colour changes may depend on progressive degeneration of chlorophyll rather than progressive loss of magnesium, but symptoms may develop abruptly when the magnesium content of the leaf falls below a certain minimum value. Upper leaflets contain less magnesium than the lower and as a rule manifest the first symptoms. The author also points out that genetic differences in oil palms may sometimes account for apparent inconsistencies in the appearance of symptoms.

In affected plantations an application of 10 lb. magnesium sulphate per palm cured the disease in nine months, though experience from earlier trials suggests that at least 18 months would have to elapse before increased yields resulted.

Histological changes in cases of confluent orange spotting showed that in this disease the collapse of the cytoplasm in potassium-deficient leaves prevents recovery after the application of potash.

MATHEW (K. T.). **Studies on the black rot of Coffee. I. The disease in South India and some general considerations. II. Nutritional requirements of Pellicularia koleroga Cooke with special reference to growth substances.**—*Proc. Indian Acad. Sci.*, Sect. B., 39, 4, pp. 133–170, 1 pl., 2 figs., 1 map; 5, pp. 179–211, 1954.

Black rot (*Corticium koleroga*) of coffee in India is severe only in areas growing *Coffea arabica* and subject to heavy south-west monsoon rains; these are the coffee growing districts of Kippa, Mudigere, Bababudans, Chickmagular, Belur, Alur, and Saklaspur in Mysore; North Coorg and part of South Coorg, the western slopes of Gudalur-Wynaad (Nilgiris and Malabar), the Biligiris, the Anamalas (Coimbatore), and the Nelliampathies (Travancore-Cochin). Humidity is the most important single factor determining the presence of the disease.

The fungus infects young shoots, leaves, and berries, entering the leaves through the stomata. It is intercellular and attacks all tissues, forming during its metabolism certain unidentified crystals. Spread occurs mainly by means of the vegetative mycelium, but under certain favourable conditions also by basidiospores, which, however, remain viable for only a short period. Under suitable environmental conditions a wide range of unrelated plants is affected. In Mysore the fungus has been observed on 33 different plants, including six *Coffea* spp. and seven other Rubiaceae. Of these natural hosts the most susceptible are: *C. arabica*, *C. eugenoides*, *Pavetta indica*, *Randia dumetorum*, *Scolopia crenata*, and *Jasminum* spp.; and moderately susceptible: *C. robusta*, *C. abeokutae*, and *Clerodendron infortunatum*.

In cultural studies at the University of Madras the optimum temperature for growth of a number of isolates of *Corticium koleroga* was found to be 21° to 23° C.; some growth occurred at 7° to 8° but none at 31° to 32°. Good growth was obtained over a pH range from 3·8 to 7·3. The addition of riboflavine, biotin, and pantothenic acid to a synthetic medium seemed to enable the fungus slowly to synthesize thiamine [*R.A.M.*, 32, p. 78]. With repeated subculturing all isolates became increasingly dependent on thiamine for their growth and the rate and amount of growth progressively decreased. With optimum thiamine, casein hydrolysate increased growth considerably. The differences between various isolates in their capacities for synthesis and the loss of some such capacities are probably due to mutations.

ROBINSON (J. B. D.). **A note on green-vein chlorosis of Coffee.**—*E. Afr. agric. J.*, 20, 3, pp. 195–197, 1 fig., 1955.

Mature *Coffea arabica* growing in Kenya is frequently affected by a form of chlorosis; the interveinal areas of the leaf become progressively paler as the severity

of the condition increases, and eventually turn yellow. The veins remain green, though in extreme cases the finer parts of the network also become bleached.

As the condition was corrected by an application of 0·25 per cent. w/v ferrous sulphate, it is concluded that it arises from a deficiency of iron [cf. *R.A.M.*, 18, p. 22; 26, p. 418; 30, p. 156] in the leaves during periods of rapid vegetative growth.

Kovoor (A. T. A.). **Some factors affecting the growth of Rhizoctonia bataticola in the soil.**—*J. Madras Univ.*, Sect. B., 24, 1, pp. 47–52, 1954.

The saprophytic existence in unsterilized soil of an isolate of *Rhizoctonia bataticola* [*Macrophomina phaseoli*] from cotton [cf. *R.A.M.*, 33, p. 446; 34, p. 517] was established in experiments using a modification of the Rossi-Cholodny technique [22, p. 449] at the University Botany Laboratory, Madras. The older hyphae are soon attacked by bacteria, particularly at high soil moisture-levels, while the younger hyphae continue growing, colonizing vegetative debris and producing sclerotia. This rapid growth serves as a method of dispersal and compensates for the lack of spores. The addition of sodium nitrate inhibited growth, presumably by stimulating antagonistic microflora, particularly *Actinomyces* spp.; calcium superphosphate stimulated *M. phaseoli*.

Ducker (H. C.). **Nyasaland Cotton Experiment Station, Chitala Progress Report for the season 1953–54.**—*Progr. Rep. Exp. Stas. Emp. Cott. Gr. Corp. 1953–54*, 9 pp., 1954. [Received 1955.]

In trials at the Cotton Experiment Station, Chitala, Nyasaland, on the control of cotton bacterial blight [*Xanthomonas malvacearum*: *R.A.M.*, 32, p. 377] perenox and perecot dusts were applied three weeks before planting at the rate of 1 lb. per 150 lb. ginned, fully fuzzed seed. At the fourth true leaf percentage angular leaf spot infection was 7·8 for perenox and 4·9 for perecot as against 26·6 for the untreated; at the blackarm phase (first flower) the corresponding figures were 4·6, 2·5, and 10·6 per cent., and the yields 384, 382, and 376 lb. of seed cotton per acre. The figures in a similar trial, but on cotton land instead of fallow, testing also the reaction of four varietal lines, CLB, CLB filter (a bulk mixture of the leading substrains), CL 20, and CL 20 filter, were: untreated, angular leaf spot 23·6, 22·6, 30·5, and 30·4 per cent.; blackarm 7, 10·2, 7·1, and 8·3 per cent.; and yield 519, 475, 601, and 624 lb.; the corresponding figures for perenox treated seed being 16·3, 13·8, 20, and 19·4 per cent.; 6·1, 6·1, 5·1, and 8·3 per cent., and 503, 519, 632, and 596 lb. Seed treatment may be regarded as a form of insurance if susceptible or partly susceptible varieties are being grown, but the introduction of truly resistant varieties may render it superfluous. Albar 51 stocks showed considerable promise when grown in observation plots at Chitala and good material was also present in Albar 59 crosses.

Šutić (D.). **Propadanje Pamuka u nekim mestima NR Makedonije.** [Decay of Cotton in some localities of the P.R. of Macedonia.]—*Zasht. Bilja* (*Plant Prot. Beograd*), *1954*, 25, pp. 53–59, 3 pl. (between pp. 48 and 49), 1954. [English summary.]

Fusarium vasinfectum was responsible for the widespread decay of cotton [cf. *R.A.M.*, 33, pp. 153, 352] in 1952 in the region of Strumica and Devdelija, Macedonia, Yugoslavia. In greenhouse experiments at the Faculty of Agriculture, Zemun, infection was found to be particularly severe when germination was retarded by low temperatures (13° to 15° C.) after sowing.

Bazán de Segura (C[onsuelo]) & Aguilar (P. F.). **Nematodes and root rot diseases of Peruvian Cotton.**—*Plant Dis. Reptr*, 39, 1, p. 12, 1955. [Multilithed.]

In Peru, cotton wilt (*Verticillium albo-atrum*) [*R.A.M.*, 23, p. 333] and root rot

(*Thielaviopsis basicola*) [30, p. 37] were regarded until recently as the most serious diseases of the crop, though many affected plants could still produce ratoons. During the last two years a distinct reduction in ratooning was observed, particularly in susceptible varieties. Field observations of ratoon cotton in the Hacienda Casablanca, Lurin Valley, and examination of dead roots from the Chinch Valley showed that the nematode *Meloidogyne incognita* var. *acrita* alone, at a high rate of infestation, can kill the plant but that equally serious effects occur when less severe nematode injury facilitates the entry of *V. albo-atrum* or *T. basicola*, or both together, even in varieties resistant to the fungi.

Vago (C.) & Hurpin (B.). **Études sur l'action des procédés de désinfection contre les germes entomophytes. I. Effet de l'aldéhyde formique en atmosphère saturée.** [Studies on the action of disinfection techniques against entomogenous fungi. I. Effect of formaldehyde in a saturated atmosphere.]—*Phytiatrie-Phytopharm.*, 3, 4, pp. 167–172, 1954.

Insect breeding is much hampered by fungal or bacterial infections, mostly due to inadequate disinfection. A simple technique, suitable for entomological laboratories lacking means of sterilization, consists in exposing equipment to formaldehyde vapour.

Tests comprised such typical procedure as dealing with contaminants on a dried smear of a culture suspension or in dry matter from decomposed insect corpses, and inside whole decomposed, dried corpses. The fungi used included *Beauveria effusa* [*R.A.M.*, 34, p. 325], *B. bassiana* [34, p. 64], *B. densa* [34, p. 325], *Metarrhizium anisophiae* [34, p. 646], *Spicaria fumoso-rosea* [21, p. 289], *Aspergillus melleus* [31, p. 476], and *Scopulariopsis brevicaulis* [32, p. 268]. For adequate disinfection empty glass or metallic laboratory utensils should be exposed to formaldehyde vapour in a gas-chamber for eight to ten hours. Breeding and storage equipment soiled by insect remains should be fumigated preferably for three to five days.

Ocfemia (G. O.). **Notes on Coffee rust and Abacá mosaic incidence in Guinobatan, Albay.**—*Philipp. Agric.*, 37, 9, pp. 550–552, 1 pl., 1954. [Received 1955.]

A brief survey from 28th November to 5th December, 1953, revealed that the remnants of *Coffea arabica* still present in the region of Guinobatan, Albay, in the Philippines are all heavily infected by rust (*Hemileia vastatrix*) [C.M.I. map No. 5].

Abaca mosaic virus [? strain of cucumber mosaic virus: *R.A.M.*, 33, p. 723] appeared to be absent from private abaca [*Musa textilis*] fields but mixed infections with bunchy top virus [34, p. 381] occurred in the variety collections at the Abaca Experiment Station, Banao.

Smith (F. F.) & Brierley (P.). **Aphid transmission of Tobacco ringspot virus in Gladiolus.**—*Plant Dis. Reptr.* 39, 1, p. 35, 1955. [Multilithed.]

In trials conducted by the Entomology and Horticultural Crops Research Branches, Agricultural Research Service, United States Department of Agriculture, nine out of 13 virus-free gladiolus seedlings exposed in 1950 to *Myzus persicae* transferred from naturally infected white-streaked gladiolus developed similar symptoms. In four separate index trials tobacco ring spot virus [*R.A.M.*, 34, p. 369] was recovered from all the nine seedlings, twice together with bean yellow mosaic and twice alone. The virus was transmitted alone from these seedlings to one out of ten healthy plants by *M. persicae* in 1954.

Brierley (P.) & Smith (F. F.). **Chrysanthemum ringspot virus, a newly recognized pathogen found in combination with Chrysanthemum stunt virus.**—*Plant Dis. Reptr*, 39, 1, pp. 33–34, 2 figs., 1955. [Multilithed.]

A new chrysanthemum ring spot virosis characterized by large, yellowish ring

patterns on the leaves was observed in combination with chrysanthemum stun virus [*R.A.M.*, 33, p. 83] in Alabama in 1953 on a garden chrysanthemum pur chased from a nursery in Ohio. The ring spot virus was readily transmitted t chrysanthemum by grafting and less so by sap inoculation, but not by *Myzu persicae*. It was not separable from the stunt virus and the combination of the tw was more damaging than stunt alone, particularly to the Good News variety.

Kristensen (H. R.). **Chrysanthemum-Virussygdomme.** [Chrysanthemum viru diseases.]—*Årsskr. Dansk Chrysanth. Selsk., 1954*, pp. 31–37, 1 fig., 1954.

Descriptions are given of the symptoms of chrysanthemum stunt and mosai viruses, of which the latter is fairly widespread in Denmark. Four categories o mosaic symptoms are differentiated as follows: severe foliar mottling, affecting th Amber Bright, Edison, Rolinda, and White Frieda varieties; milder foliar mottlin on Golden Globe, Little America, October Red, Toxedo, and Verinette; striped an spotted flowers, typical of Aegypten, Amber Bright, Desert Song, Fury, Golde Mary Elisabeth, Gypsy, October Red, Orchis, Queen of the Pinks, Rolinda, Tem pest, and Toxedo; and malformed and rumpled flowers, associated with Josep Nachtarin, Little America, Yellow Long Island Beauty, White Frieda, and Yello Grace. The virus is transmissible [cf. *R.A.M.*, 31, p. 239] to tobacco, petunia, Ne Zealand spinach [*Tetragonia expansa*], *Gomphrena globosa*, and tomato, causin in the last-named a very severe disease apparently the same as tomato asperm [34, p. 456].

Control measures should include stringent sanitation, avoiding all contac between diseased and healthy plants by means of hands or implements; frequen applications of aphicidal sprays to exterminate the vectors of the virus; timel roguing and destruction of diseased or suspected plants in otherwise healthy stands and (most important of all) careful selection at flowering time of sound stocks fo propagation, which should be regularly tested for freedom from infection by sa inoculation on tobacco.

Ara (S. H.) & Mahmud (K. A.). **Blossom blight of Zanonia indica Linn.**—*Curr Sci.*, 23, 11, p. 365, 1954.

Choanephora cucurbitarum, not previously reported on any species of *Zanonia* was responsible for blossom blight of *Z. indica* at Dacca, India, in 1953. The disease is characterized by minute, brown spots on the petals, rapidly enlarging and turning black and involving the whole corolla and calyx. In the later stages the discolora tion and rotting spread to the pedicels and rachis and the flowers become covered with silvery-white conidiophores. Symptoms developed within 24 to 36 hours o inoculating the inflorescence with a conidial suspension and the fungus was readil reisolated.

Tandon (R. N.) & Bilgrami (K. S.). **Phyllosticta cycadina (Passer) on Cycas revoluta.**—*Curr. Sci.*, 23, 11, pp. 370–371, 1954.

A description is given of the disease caused by *Phyllosticta cycadina* on *Cycas revoluta* in India. Infected parts of the leaflet, usually appearing first at the tip and spreading towards the base, but sometimes occurring quite irregularly, are first yellowish, later light brown, and finally ash-coloured; they may develop black pycnidia, particularly on the lower surface, and finally, in four to five months fall out. The disease is most severe in October to February. In inoculation experiments symptoms were produced on *C. revoluta* after eight days if moist cotton pads were applied regularly for the first four, and after 12 days if the plants were kept in a moist chamber. Infection failed to develop on the uninjured upper surface but appeared without injury on the lower, the fungus entering through the stomata. Of the mercurial and copper fungicides tested for the control of the disease, copper sandoz and tillex dusts were the most effective when applied within three days of inoculation.

Scurti (Jole). **Sulla Botrytis gladiolorum Timm.** [On *Botrytis gladiolorum* Timm.] *Ann. Sper. agr.*, N.S., 8, 2, pp. 475–487, 1 pl., 1 fig., 1954. [English summary.]

At the Experimental Station for Agricultural Chemistry and the Experimental Laboratory of Phytopathology, Turin, Italy, the author isolated *Botrytis gladiolorum* [cf. *R.A.M.*, 34, p. 38] from a spongy rot of gladiolus corms. The dimensions of the conidia and the appearance of the fungus varied greatly on different media. The macroconidia developed more readily on poor than on rich media. On potato-dextrose agar and Massee's medium in hanging-drop cultures the macroconidia mostly measured 12 to 22·5 by 7·5 to 10 μ, while a few were 24 by 9 or 30 by 7 μ. The microconidia, which formed in profusion and germinated *in situ*, were colourless, globose or spherical, and measured 2·5 to 3 μ in diameter, a few being slightly larger. On plaster plates and gladiolus leaves the mycelium was sparse, while the brown conidiophores, 15 to 20 μ in diameter, were produced abundantly. On the richer media the conidia were borne along the length of the conidiophore or at the extremity; on the poorer they occurred terminally only. Although resembling *B. cinerea*, especially on plaster plates and gladiolus leaves, the fungus should be regarded as distinct, as the conidia are larger and the conidiophores, conidia, and sclerotia less readily formed. It is concluded that spongy rot of gladiolus corms is almost always caused by *B. gladiolorum*.

Hutton (E. M.) & Peak (J. W.). **Varietal reactions of Trifolium subterraneum L. to Phaseolus virus 2 Pierce.**—*Aust. J. agric. Res.*, 5, 4, pp. 598–607, 1954.

At the Dickson Experiment Station, Canberra, Australia, up to 20 per cent. of the spaced plants in hybrid progenies of subterranean clover (*Trifolium subterraneum*) are affected annually by a mosaic disease experimentally demonstrated to be due to *Phaseolus* virus 2 [bean yellow mosaic: cf. *R.A.M.*, 33, p. 8], probably the same virus as described by Aitken and Grieve from Victoria [22, p. 485] and by Watson from South Australia [29, p. 140]. Most collections of the virus from legumes (including those from subterranean clover) in the Canberra area and from a few districts in New South Wales and Victoria represented severe strains, while a few, including some from gladiolus, produced mild reactions.

Ten plants of each of 51 varieties of subterranean clover were hand-inoculated with the severe strain. Northam First Early, Dwalganup, and Pink Flowered reacted with a lethal necrosis, accompanied by a transitory mottle in a few leaves. The other varieties developed mottling of various intensities. Only two plants of the mottle-reacting types failed to develop symptoms after inoculation, though 16, 20, and 26 per cent., respectively, of Northam First Early, Dwalganup, and Pink Flowered remained apparently healthy.

Hand-inoculation of the severe and mild strains and aphid (*Myzus persicae*)- and hand-inoculation of the severe strain were carried out. Hand-inoculation of Northam First Early, Dwalganup, Pink Flowered, Mount Barker, and Tallarook, with the mild strain gave, respectively, 45, 35, 30, 62·5, and 70 per cent. infection, as against 92·5, 87·5, 85, 100, and 100 with the severe strain. Aphid transmission of the severe strain gave 42·5, 50, and 67·5 per cent. infection in Northam First Early, Dwalganup, and Mount Barker, respectively, the corresponding figures for hand transmission being 95, 90, and 100.

Of 20 uniform potted plants of each of Northam First Early, Dwalganup, Pink Flowered, Mount Barker, and Tallarook, ten of each variety were inoculated twice with the severe strain at an interval of 14 days. All the lethal-reactors, as well as Mount Barker and Tallarook, became infected. When (after 18 weeks) lethal necrosis of the runners had just started in Northam First Early, Dwalganup, and Pink Flowered, all the plants were cut off at soil level and weighed. Reductions in mean weights of the plants due to infection were 76·7, 71·4, 42·1, 26·1, and 72·8

per cent. respectively. No differences were found between lethal- and mottle-reacting varieties in the number and size of the inclusion bodies in infected leaves, which were absent from unmottled leaves. Viroplasts in young tip-leaves did not stain when the plants were held at temperatures below 44·6° F., whereas those in mature basal leaves were not so affected. Evidence indicated that resistance was linked with lethal-reaction and depends on a virus-inactivating system integrated with another enzymatic system governing the development of lethal necrosis. The lethal reaction to the virus in Northam First Early, Dwalganup, and Pink Flowered was ascertained to be dominant in most crosses, indicating that the development of varieties with field resistance combined with desirable characters should be comparatively easy.

Tyson (A. G.). **Manganese deficiency in Subterranean Clover (Trifolium subterraneum L.).**—*Aust. J. agric. Res.*, 5, 4, pp. 608–613, 1 pl., 1954.

In experiments conducted at the Waite Agricultural Research Institute, Adelaide, South Australia, manganese deficiency in *Trifolium subterraneum* [cf. *R.A.M.*, 32, p. 563] grown in pots of a Kangaroo Island soil, the pH of which had been adjusted from 6·2 to 6·3–6·5 greatly reduced yields. The manganese content of healthy plants expressed on a dry matter basis ranged from 30 p.p.m. on a slightly acid soil to over 300 p.p.m. on a highly acid one, whilst that in deficient plants ranged from 4 to 25 p.p.m. It is suggested that at the flowering stage 25 p.p.m. is the minimum amount required for healthy growth of subterranean clover. Deficient plants in the field contained as little as 9·4 p.p.m. Applications of manganese sulphate to the soil at the rate of 56 lb. per acre prevented the appearance of manganese deficiency symptoms, increased the manganese content of the plants to 35 p.p.m., and raised the yield of dry matter from 3·5 to 67·2 gm. per pot.

Valder (P. G.). **Diseases of Clovers in New South Wales.**—*Agric. Gaz. N.S.W.*, 65, 9, pp. 465–471, 501, 9 figs., 1954.

Seventeen parasitic diseases are now known to occur on *Trifolium* species in New South Wales. Rusts have been observed on *T. glomeratum*, *T. incarnatum*, *T. pratense*, *T. subterraneum* [see next abstract], and *T. repens*, on which strains of *Uromyces trifolii* [*R.A.M.*, 23, p. 251] produce reddish-brown sori about 1 mm. in diameter on leaf blades and petioles. The disease is serious on *T. subterraneum* and *T. repens*, often causing distortion and killing leaves and stems, or even whole plants. *Uromyces flectens* causes a similar type of distortion on *T. repens*.

Root and crown rot diseases are serious only with *T. pratense*, plants of which often wilt and collapse in their second year. Associated fungi include *Fusarium* spp. [32, p. 383], *Macrophomina phaseoli*, *Rhizoctonia* [*Corticium*] *solani* [30, p. 622], and *Sclerotium rolfsii* [31, p. 422].

Anthracnose (*Colletotrichum trifolii*) [31, p. 557] causes dark lesions on stems and petioles which may be followed by die-back and crown rot; powdery mildew [*Erysiphe polygoni*: 31, p. 386] is common on subterranean clover on the north coast; downy mildew (*Peronospora* sp.) [23, p. 112] attacks *T. glomeratum* at Narara; while leaf spot, black stem, and stem decay (all due to *Ascochyta* sp.) were recorded in the Bathurst-Orange area in 1948 during moist weather, where they caused losses of 75 per cent.

Minor fungus diseases of little economic importance are sooty blotch (*Dothidella* [*Cymadothea*] *trifolii*) [21, p. 527], leaf spots caused by *Pseudopeziza trifolii* [31, p. 516], *Stemphylium sarciniforme* [32, p. 563], and *Cercospora* sp. [23, p. 68], recently recorded in Taree.

The most common virus diseases are of the mosaic type, the symptoms not being easily detected in mixed pastures. They have caused considerable fodder losses in some areas, having been observed on *T. subterraneum*, *T. pratense*, *T. incar-*

natum, crimson clover, *T. alexandrinum*, *T. glomeratum*, and burr medic (*Medicago denticulata*), but rarely on *T. repens*.

PETERSON (S.). **Rust in Subterranean Clover.**—*Agric. Gaz. N.S.W.*, 65, 11, pp. 597–602, 605, 7 figs., 1954.

Subterranean clover (*Trifolium*) [*subterraneum*], the most important sown pasture species in New South Wales, was heavily attacked by leaf rust (*Uromyces trifolii*) [see preceding abstract] during 1951–53, in all regions of the State except the tableland and the northern and central slopes, where dry conditions prevailed. The variety Mt. Barker was most severely affected and damage was greatest in the coastal districts; in certain cases entire clover stands were killed at seedling or flowering stages and growth was reduced by 60 to 70 per cent. Early autumn and spring weather favour rust development, which is also stimulated by showery conditions, irrigation, heavy dew, dense swards, and poor nodulation. It is concluded that the rust is of considerable economic importance, particularly as acreages planted to clover are expanding and recurrence must be expected. The highly susceptible Mt. Barker should be replaced by a more resistant variety, but as yet no known and tested variety is available. Breeding programmes are in progress.

SAROJINI (Mrs. T. S.). **Soil conditions and root diseases XI. Neocosmospora vasinfecta Smith disease of Cajanus cajan.**—*J. Madras Univ.*, Sect. B., 24, 1, pp. 137–142, 1954.

In a further contribution to this series [cf. *R.A.M.*, 34, p. 319], *Neocosmospora vasinfecta* was isolated from roots of wilted pigeon peas in an experimental plot at the University of Madras [33, p. 626]. Conidial and chlamydospore isolates were found to be more virulent to pigeon pea than the original strain, its ascospore derivatives, or *Fusarium udum* [32, p. 23]. The symptoms were similar to those caused by *F. udum*. Seedling infection at the first leaf stage was indicated by preliminary curling of leaf tips, while in older seedlings gradual yellowing of the leaflets was followed by wilting and collapse of the plant. Infection ranged from 63 to 100 per cent. Microscopic examination of the diseased portions of the hypocotyl and roots of plants infected with the ascogenous strain showed numerous perithecia, while the other series yielded asexual spore forms in large numbers.

It is concluded that *N. vasinfecta* should be classed with the 'soil inhabiting' group of facultative saprophytes, like certain *Fusarium* spp., being capable of a parasitic existence when the occasion arises. It has been found in many arable and scrub jungle soils examined in the University laboratory.

SILVER (W. H.). **Studies on the smut of Johnson Grass. II. Further studies on sporidial cultures.**—*Proc. Okla. Acad. Sci.*, 34 (*1953*), p. 136, 1955.

At the Southeastern State College, Durant, Oklahoma, the sporidia of each of five accessions of smut [*Sphacelotheca* spp.] of Johnson grass [*Sorghum halepense*] (*Proc. Okla Acad. Sci.*, 33 (*1952*), pp. 183–185, 1954), collected over a wide area, were used for inoculating individually solutions of various carbon sources and behaved similarly on all of them. Growth was good on fructose, glucose, sucrose, and maltose. Using only accessions S–1 and S–8 and four enzyme inhibitors, sodium azide alone inhibited growth during three days' incubation in all carbon sources without necessarily stopping it.

ØHLERS (H.). **Oversigt over prisforholdet m.m. mellem forskellige bekæmpelsesmidler til sprøjtning af frugttræer.** [A survey of cost relationship and the like between various plant protectives for the spraying of fruit trees.]—Reprinted from *Erhvervsfrugtavleren, 1955*, 6, 7 pp., 1955.

Up-to-date information is tabulated on the composition, recommended concentrations, manufacturers, and uses of the fungicides and other plant protectives

sold in Denmark for the control of fruit diseases and pests [cf. *R.A.M.*, 34, p. 468].

Dunegan (J. C.). **New materials and methods for fruit disease control.**—*Agric. Chemic.*, 9, 1, pp. 38–39, 120–121, 1954.

Brief notes are given on fungicides developed since the war for use on fruit trees, and the diseases best controlled by each. The more recent developments in the use of antibiotics against bacterial diseases [*R.A.M.*, 34, p. 536] are described. Emphasis is placed on the danger of using unsuitable concentrations of fungicide.

Stanković (D.) & Bećarević (A.). **Promene metabolizma fosfora u organima nekih vrsta voćaka izazvane fitopatogenim virusima i parazitnim gljivicama.** [The changes in phosphorus metabolism in the organs of some fruit tree varieties caused by phytopathogenic viruses and parasitic fungi.]—*Zasht. Bilja* (*Plant Prot., Beograd*), *1954*, 26, pp. 3–8, 1954. [English summary.]

At the Faculty of Agriculture, Zemun, and the Institute for Nuclear Physics, Vinča, Yugoslavia, phosphorus metabolism was compared in healthy and diseased parts of fruit trees, using labelled phosphorus (P_{32}). In peach trees infected with *Taphrina deformans* [*R.A.M.*, 31, p. 594] a considerable increase in phosphorus metabolism was observed in the leaves and a decrease in the wood and bark tissues. Similar results were obtained in preliminary trials with cherry trees infected with *Clasterosporium carpophilum* [34, p. 516], apple with *Venturia inaequalis* [34, p. 599], and pear with *V. pirina* [31, p. 594]. In Italian plum trees infected with a mosaic virus [see below, p. 731] the effect was less noticeable, the metabolism generally increasing in the leaves, wood, and bark, but not in the fruit.

Vlasveld (W. P. N.). **De ziektebestrijding in 1954.** [Disease control in 1954.]—*Fruitteelt, 1954*, 12, pp. 1056–1057, 1061, 5 figs., 1954.

In 1954 the first ascospores of apple scab [*Venturia inaequalis*] were detected in Holland [*R.A.M.*, 33, p. 33] on 30th March. Very cold, raw weather prevailed during April, and the first periods of general infection developed from 19th to 21st and 23rd to 24th May. The post-blossom application of mercurials caused severe damage to the leaves, which is also apt to result from combined treatment with various fungicides and liquid parathion. A sequence of critical periods in June facilitated the spread of infection, but the occurrence of late attacks on trees which remained scab-free until the end of ascospore discharge appears inexplicable unless the conidia are disseminated over wide areas, with or without the aid of insects.

The first outbreaks of apple mildew [*Podosphaera leucotricha*: 31, p. 479] developed during the second half of May, with another critical period at the end of June, while infection apparently took place as late in the season as the beginning of August. The efficacy of sulphur sprays depends on their application immediately preceding a dry, warm spell. The excision of diseased shoots during and after the winter is of great importance. *P. leucotricha* has also been observed on the fruits of certain pear varieties.

Despite preventive applications of copper fungicides mixed with wheat flour, apple trees in the Limburg district were extensively attacked by *Phytophthora cactorum*, causing collar rot. On pears the same fungus was responsible for a characteristic fruit rot [cf. 26, p. 157] which many growers had never seen before.

Rough skin virus appears to be spreading widely on the Golden Pippin and Glory of Holland apple varieties [34, p. 374]. Applied weekly from the onset of flowering, thiram has given excellent control of *Botrytis cinerea* on strawberries. On the other hand, the elimination of the raspberry cane blight [*Didymella applanata*] complex presents great difficulties, and experiments are in progress on the extermination of the cane midge (*Thomasinia theobaldi*), suspected of being one of the factors concerned [32, p. 262].

Posnette (A. F.) & Cropley (R.). **Distribution of rubbery wood virus in Apple varieties and rootstocks.**—*Rep. E. Malling Res. Sta., 1953*, pp. 150–153, 1954.

At East Malling Research Station apple trees and stocks were indexed for rubbery wood virus [*R.A.M.*, 33, p. 89] by grafting with Lord Lambourne scions. Rootstock stools were budded or grafted and tree scions were double-budded or -grafted using Malling II healthy stocks and Lambourne scions. Scions were tested by the hand-bending method [30, p. 167] mostly after one season's growth and in some cases after two.

In bud tests 96 per cent. of the indicators from rubbery Lord Lambourne developed symptoms in the year of inoculation or in the year following, though two years may be required for diagnosing mild strains of the virus. Virus variation resulted in different degrees of rubberiness. It was found that the index and indicator buds should be placed on the same side of the stock, but not necessarily exactly aligned. Eighty per cent. of the M. I and M. IX stoolbeds at the Research Station were infected. Some stools of M. IV and Crab C were also infected. However, no virus was detected in the new Malling-Merton series or in nine rootstocks of the M. IX crosses tested. Virus-tested sub-clones of the Malling series are now being multiplied rapidly for general use. Many of the orchard varieties on the Station are infected; there was evidence that the virus had been spread by propagation rather than from tree to tree.

Hemphill (D. D.) & Goodman (R. N.). **Effects of plant growth-regulating substances on control of Erwinia amylovora by streptomycin and terramycin.**—*Science*, **122**, 3159, p. 122, 2 graphs, 1955.

Experiments at the Department of Horticulture, University of Missouri, Columbia, were continued [cf. *R.A.M.*, 33, p. 373] to determine whether the increase in the effect of an antibiotic spray for the control of apple fireblight (*Erwinia amylovora*) [34, p. 101] by indole-3-acetic acid was peculiar to it. A high degree of effectiveness was obtained with ethyl indole-3-acetate at 50 p.p.m., and a similar increase appears to be a function also of another group of non-indigenous substances capable of regulating plant growth, including α-naphthalene acetic acid, naphthyl acetamide, β-naphthoxyacetic acid, *p*-chlorophenoxyacetic acid, 2,4,5-trichlorophenoxypropionic acid, 2,3,5-triiodobenzoic acid, α-cyano-β-2,4-dichlorophenylacrylic acid, maleic hydrazide, *p*-chlorophenyl- and 2,4-dichlorophenyl-tetradecyl ether, *N*-*m*-tolyl phthalamic acid, and 2,2-dichloropropionic acid. The most promising was naphthyl acetamide, which was effective at a lower concentration than indole-3-acetic acid and its ethyl ester, and modified apple foliage less at 20 p.p.m. than did the other two at 100 and 50 p.p.m., respectively. Methyl cellosolve and carbowax 4000 markedly increased disease control in these experiments also. In *in vitro* tests on both solid and liquid media, using the agar diffusion-filter-paper-disk technique, no enlargement of the inhibition zone resulted when the plant growth regulators were added to the antibiotic solutions. Also, it was impossible with the standard tube-dilution technique to decrease the minimum inhibitory concentration of the antibiotics.

These results seem to indicate that the enhanced disease control is not a direct effect of growth-regulating substances on the pathogen but of some host reaction.

Haller (M. H.). **Apple scald and its control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1380, 9 pp., 2 figs., 1954.

In this bulletin, a further revision of that published in 1923 [cf. *R.A.M.*, 27, p. 137], the most recent practical information concerning the incidence of apple scald [33, p. 608] and its control is briefly presented.

Padfield (C. A. S.). **The storage of Apples and Pears.**—*Bull. N.Z. Dep. sci. industr. Res.* 111, 96 pp., 48 figs., 1954. [Received August, 1955.]

All relevant New Zealand literature was searched in the preparation of this bulletin concerning apple and pear storage and some unpublished results of L. W. Tiller's work on orchard storage and the effect of manurial treatment on storage quality is also included. The work is divided into three parts: pre-storage conditions (pp. 11–31); conditions in the store (pp. 32–48); and physiological disorders and fungous rots of stored fruit [*R.A.M.*, 33, p. 91; 34, p. 158] (pp. 49–93), each of which is fully described from the aspects of symptoms, varietal susceptibility, cause, and control. There is a bibliography of 60 titles.

Bottini (E.). **Le malattie da frigorifero dei prodotti ortofrutticoli nei loro riflessi commerciali.** [Cold storage diseases of fruit and vegetables in relation to their commercial consequences.]—*Ann. Sper. agr.*, N.S., 8, 2, *Suppl.*, pp. I–XII, 1954. [English summary.]

In view of the differences of opinion sometimes entertained by refrigeration engineers on the one hand and growers and dealers on the other as to the precise origin of the physiological abnormalities occurring in fruit and vegetables during cold storage, the author briefly recapitulates the results obtained in 20 years' investigations at the Institute for Agricultural Chemistry, Turin, Italy, of the causation and symptoms of internal breakdown and scald of apples and pears [*R.A.M.*, 9, p. 726], brown heart and bitter pit of apples, peach breakdown [9, p. 255], oleocellosis of oranges [14, p. 356; 28, p. 626], and superficial spotting of bananas. Notes are also given on similar investigations carried out in other countries. Further work is necessary before a correct nomenclature for these disorders can be established, their exact causes determined, and a standard rule set up by which it can be decided which fruits and vegetables possess adequate resistance to cold storage conditions.

Scaramuzzi (G.) & Ciferri (R.). **Descrizione di fenomeni di allofillia in alcune Drupacee.** [A description of allophylly phenomena in some Drupaceae.] —*Ann. Sper. agr.*, N.S., 8, 1, pp. 95–111, 11 figs., 1954. [English summary.]

After referring to Klášterký's distinction between the two forms of leaf malformation which he termed 'heterophylly' (morphology determined by hereditary factors or environmental conditions) and 'allophylly' (variability due to pathological causes) [cf. *R.A.M.*, 31, p. 38], the authors describe their preliminary studies on allophylly of peach, cherry, and apricot leaves in Italy. The peach leaves observed were small or short, with a deeply divided blade, the two segments opening widely away from one another in varying degrees, generally along the midrib. The malformations seen in the cherry leaves were similar, the modifications of the margins being more marked than in peach. The apricot leaves were usually smaller than normal, and rhomboid or varyingly elliptical.

The malformations resembled certain virus-like diseases reported from the United States [32, p. 681], such as cherry crinkle leaf (without the leaf spots) and deep suture [24, p. 324]. They also appear to come within the definition of 'bud mutations' (*J. Hered.*, 27, 12, pp. 487–494, 1936). The laciniation of vine leaves reported by Branas as a somatic mutation [*R.A.M.*, 32, p. 170] has characteristics in common with the abnormalities described.

These phenomena can, apparently, be divided into two groups, in one of which the leaf abnormalities are not transmissible by grafting and in the other they are transmissible by vegetative propagation. The authors doubt whether the distinction between 'bud mutation' and 'morphogenic necrosis' can be sustained, and suggest that necroses which remain latent in the plant during winter may be responsible for both conditions.

Scaramuzzi (G.). **Alcune carenze nutrizionali sperimentali del Pesco in rapporto ai sintomi fogliari di leptonecrosi.** [Some experimental nutrient deficiencies of Peach in relation to the leaf symptoms of leptonecrosis.]—*Ann. Sper. agr.*, N.S., 8, 1, pp. 77–94, 3 col. pl. 6 figs., 1954. [English summary.]

In 1951, some 300 one- to two-year-old peach trees were planted experimentally in the Botanical Gardens, Pavia, in light, sandy soil very poor in nutrient elements, no application of manure or mineral fertilizer being made at planting or during the succeeding year. In the spring of 1952, the leaves of these trees suddenly developed an abnormal appearance and growth lagged behind that of similar-aged peach trees elsewhere in the Gardens. The affected trees fell into four groups, according to the symptoms displayed. In the first (and largest) group, growth was restricted and the shoots were short and thin and gradually turned dark red. At the beginning of the season, the basal leaves were dark green, the upper surface turning bronze, and by mid-June the edges rolled inwards. At this stage the margins of the under-surface were wine-red. All the leaves on a branch became thus affected, followed by premature defoliation, a terminal tuft of leaves usually remaining.

In the next largest group of trees the lowest leaves on the small branches displayed a greenish-yellow discoloration uniformly spread over the blade, while the leaves at the tip were a normal green. Subsequently, the latter also became greenish-yellow, while the small branches were short, thin, and rigid, with reddish-brown bark. The condition spread progressively upward from the lowest branches. By the end of July or the beginning of August, the basal leaves were reddish-yellow with reddish-brown spots.

A third, and smaller, group of trees presented either of these two sets of symptoms together with a leaf curl, affecting mainly the midrib, and sometimes the blades, of leaves in the middle of the branches.

In the fourth group by the beginning of July the apices of many shoots were completely necrosed, together with the topmost leaves, to a distance of two to three cm. The root tips were also necrosed, and a new secondary rootlets had developed.

The results of fertilizer tests, in which phosphorus, nitrogen, and potassium were applied alone and together in various combinations indicated that the first group of symptoms was probably due to a deficiency of both potassium and phosphorus, the second to nitrogen deficiency, and the third to potassium deficiency; no experimental data regarding the fourth group were obtained, but it is suggested that the symptoms were due to calcium deficiency.

The first condition, which resembled the leptonecrosis of peaches reported from Verona [cf. *R.A.M.*, 23, p. 128], except that no phloem necrosis was present, appeared to correspond to the North American non-parasitic 'false little peach'.

Jordović (M.). **Obićan mozaik na nekim sortama Šljiva.** [Common mosaic on some Plum varieties.]—*Zasht. Bilja* (*Plant Prot., Beograd*), *1954*, 25, pp. 73–75, 1954. [English summary.]

Of 80 plum varieties in the orchard of the Institute for Fruit Production, Čačak, Yugoslavia, 32 were infected in varying degrees by plum mosaic virus [cf. *R.A.M.*, 33, p. 95, and above, p. 728], the remainder showing no symptoms.

Pejkić (B.) & Vasiljević (L.). О неким проузроковачима некрозе Бресквe. [Concerning certain causes of Peach necrosis.]—Зборн. Радова пољопр. Фак., Београд. [*Rev. Res. Fac. Agric., Beograd*], 2, 1, pp. 148–163, 12 figs., 1954. [French summary.]

Possible causes of a branch necrosis of peach trees, very common in Yugoslavia, were studied at the University of Beograd. Among the fungi isolated from diseased trees, *Valsa leucostoma* [cf. *R.A.M.*, 31, p. 21] was found to accelerate the onset and increase the percentage of necrosis although it was not the primary and only cause.

Affected parts of the tree contained more resin than the healthy, particularly in Hale's Early. Necrosis appeared to be the result of the poor development of the upper branches. Painting with grafting wax reduced but did not entirely prevent the disease.

KIRKPATRICK (H. C.). **Infection of Peach with Apple mosaic virus.**—*Phytopathology*, 45, 5, pp. 292–293, 1 fig., 1955.

At the Tree Fruit Experiment Station, Wenatchee, Washington, three Lovell peach seedlings inoculated with apple mosaic virus [*R.A.M.*, 23, p. 391] in the autumn of 1950 developed a transitory, faint line pattern in the first flush of growth a year later, after a dormant period in a cold room. The same process was repeated in the summers of 1952 and 1953. In the former year five Golden Delicious apple seedlings were each budded with a single softwood bud from one of the peach trees. At the same time three apple seedlings were inoculated with apple mosaic virus from the original source.

Apple mosaic symptoms developed in some of the apple seedlings in each group during the growing seasons of 1952 and 1953, no differences being discernible between those induced by the inoculum from peach and from the original source. It is apparent from these results that peach is susceptible to apple mosaic virus and that its mild, transient reactions might well be overlooked in orchard trees.

FOSTER (L. J.). **Agricultural notes. Peach mildew.**—*Nyasald Fmr & Forest.*, 2, 3, pp. 37–38, 1954.

Brief notes are given on the incidence, symptoms, and control of peach powdery mildew [*Sphaerotheca pannosa*: cf. *R.A.M.*, 33, p. 305], which is most severe in irrigated areas in Nyasaland. It is recommended that resistant subtropical Chinese varieties, such as Angel, Waldo, Killiekrankie, and Beauty of Booradabin are most suitable for growing under local conditions.

ADAM (A. V.), POWELL (D.), & ANDERSON (H. W.). **Time of Peach twig infection by Xanthomonas pruni in relation to spring-canker incidence.**—*Phytopathology*, 45, 5, pp. 285–287, 1955.

The results of a study from 1952 to 1954 at the Illinois Agricultural Experiment Station showed that August is the best month for the inoculation of peach trees with *Xanthomonas pruni* to obtain a high incidence of twig canker in the following spring under local conditions [*R.A.M.*, 32, p. 490]. The numbers of spring cankers were shown to be directly proportional to the percentage of foliar infection in the previous summer. *X. pruni* survives the winter in twig tissues inoculated by the 'forced stream' method during the latter part of the growing season. This procedure consists in the application to the trees, by means of a single-nozzle gun with a $\frac{3}{64}$ in. aperture adjusted to a solid stream at 200 lb. pressure, of a bacterial suspension previously shaken for 30 hours and diluted at the ratio of 1,000 ml. to 6 gals. tap water. The experiments were performed during sunny periods between 10 a.m. and 2 p.m. on two-year-old Elberta trees, the gun being kept at a distance of 4 to 6 ft. and pointed upwards at an angle of roughly 60° to ensure maximum contact of the stream with the lower leaf surfaces. The terminal portion of the twig was found to be the most suitable tissue for inoculation with a view to the survival of winter and production of spring infection. However, the ratio of terminal 'black-tip' to internodal cankers during the period of this study was approximately 1:1.

ALCORN (S. M.), WILHELM (S.), & THOMAS (H. E.). **A mosaic disease of Himalaya Blackberry.**—*Phytopathology*, 45, 5, pp. 272–274, 1 fig., 1955.

A virus complex is suspected as the cause of a mosaic disease which has been responsible since 1945 for increasingly severe damage to Himalaya blackberry

(*Rubus procerus*) plantings in the central coastal areas of California. Lloyd George raspberry and Lovell peach plants inarch-grafted to affected blackberries developed symptoms suggestive of a virus. They included on the former leaf contortion with chlorotic rings and blotches on the inoculated shoot and its branches, and on the latter (the following season) failure of lateral buds or the formation of clusters of dwarf, misshapen leaves, some with chlorotic areas along a distorted midrib, or occasionally along a lateral vein. The disease was progressive year by year until the whole plant was affected. In the case of peach some analogies with the yellow bud mosaic virus [*R.A.M.*, 31, p. 228] were observed.

GOHEEN (A. C.). **Methods for determining the success of graft unions between plants in Strawberry virus studies.**—*Plant Dis. Reptr*, 39, 1, pp. 31–32, 2 figs., 1955. [Multilithed.]

Two methods were developed at Beltsville, Maryland, for determining the success of graft-unions between strawberry plants used in virus studies, and thus avoiding the necessity of retesting if no symptoms appear on the indicator. By the runner-severance method a runner inarch graft is made between the test plant and the indicator (*Fragaria vesca*) [*R.A.M.*, 31, p. 441] and the paired plants are left to grow for six to eight weeks. The runner of the mother strawberry plant is then severed below the graft and the first daughter plant is separated from any subsequent daughter plants, its roots and some leaves being carefully removed. The daughter is thus supported entirely through the graft to the *F. vesca* plants. If it has not wilted after about four days, the graft is successful.

For strawberry varieties which do not form runners readily in the greenhouse, or when a virus test is desired before runners are produced, a graft may be made between a petiole of the test plant and a stolon of the indicator [21, p. 380]. Four days before examining for virus transmission the petiole is severed from the test plant at a point below the graft. The green colour and turgidity of the severed leaf indicate that the union has been successful.

POSNETTE (A. F.) & CROPLEY (R.). **Strawberry yellows in the variety Auchincruive Climax.**—*J. hort. Sci.*, 30, 1, pp. 55–61, 2 pl., 1955.

In spring, 1950, abnormal yellowing occurred in fields of young Auchincruive Climax strawberry, spreading each year until in 1953 it was common throughout Great Britain. Two distinct, non-infectious, probably genetic abnormalities now affect Climax [*R.A.M.*, 31, p. 558], transient yellows (similar to June yellows in Blakemore [cf. 34, p. 655]) and streak. There is evidence that they are not graft-transmissible, and they seem to occur spontaneously in insect-proof glasshouses. From April to early June young leaves developed bright yellow sectors. Symptoms disappeared in late May and June and when affected plants were brought into a heated glasshouse. Symptoms sometimes reappeared in autumn, particularly in young runners.

In addition, the leaves sometimes bore white streaks, severe streaking often causing serrated, puckered, and distorted leaves; the lower surfaces were mottled with dark and light green areas delimited by veins. Badly affected plants became grey-green. Streak appeared on leaves expanding in the spring, and white or grey-brown streaks subsisted until the leaves died. Plants with yellows in autumn invariably developed streak in spring, runners being affected more strongly than parent plants; roguing yellowed plants, however, did not completely eliminate streak.

The development of transient yellows and streak in four sub-clones (strains) of Auchincruive Climax is described. In the strain which had not been propagated intensively, yellows developed a year later than in those which had undergone unlimited runner production for five years.

Vigour and yield were greatly reduced by streak. There was evidence that even

mild transient yellows impaired the vigour of the plant, reducing the mean surface of a plant by one third (from 375·8 sq. in. to 258·4 sq. in.), but no data were available regarding its effect on yield.

Posnette (A. F.) & Cropley (R.). **Field studies on virus diseases of Strawberries II. Seasonal periods of virus spread.**—*Rep. E. Malling Res. Sta., 1953*, pp. 154–157, 3 graphs, 1954.

In a further study in this series [*R.A.M.*, 33, p. 96] the exposure from 1951 to 1953 of successive batches of *Fragaria vesca* plants to virus infection in an unsprayed strawberry plot demonstrated that the two main periods of virus spread were during May and June for viruses 1 and 2 (mild crinkle and yellow edge) and during autumn, chiefly for virus 2. There was a close relationship between the number of aphids (*Pentatrichopus fragaefolii*) on the permanent plants in the plot, the number of *F. vesca* plants becoming infested, and the number infected in each exposure period. There was little spread to plants guarded from wingless aphids by the erection of greased collars, though these may have afforded some protection from winged aphids also. The autumn period of virus spread was the most dangerous from the aspect of strawberry propagation and probably accounts for the high incidence of yellow edge which occasionally appears in young plants grown from certified stock.

Guyot (H.). **La lutte contre Cercospora musae dans les Bananeraies de Guadeloupe. Essais de nébulisation (fogging).** [The control of *Cercospora musae* in the Banana plantations of Guadeloupe. Experiments with fog-spraying (fogging).] —*Fruits d'outre mer*, 8, 11, pp. 525–532, 3 pl., 1 diag., 1953.

In January, 1953, six-month-old banana plants at Petit-Bourg, Guadeloupe, were treated every 15 days up to May, and thereafter at eight-day intervals in four lots; fog applications of (*a*) zineb, (*b*) zineb or copper (according to wind direction), or (*c*) copper oxychloride, all suspended in oil, compared with (*d*) a customary copper oxychloride spray, for the control of leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: *R.A.M.*, 34, p. 659]. The fog-applicator, drawn by a jeep, delivered 40 l. per ha.

The disease was virtually absent from the fog-sprayed plots, except in the centre of a piece of high ground where the plants sustained 5 to 10 per cent. infection, and the foliage was a healthy green. On the whole the zineb treatment gave more vigorous plants and healthier and more abundant foliage than the copper mixture, the zineb-or-copper plots being intermediate. Almost the entire foliage in the normally sprayed plots was diseased by the end of the season. This is the first time that such complete control of *M. musicola* has been secured.

Py (C.) & Barbier (M.). **La production de l'Ananas en Guinée en vue de l'exportation en frais.** [Pineapple production in Guinea from the aspect of their exportation fresh.]—*Fruits d'outre mer*, 8, 8, pp. 363–392, 27 figs., 9 diags., 16 graphs, 1953.

In the course of an account of pineapple production for export while fresh the author states that pineapples in French Guinea are subject to various non-parasitic disorders including sun-scald, cracking apparently caused by water disequilibrium which permits the entry of secondary parasites, and yellowing or accelerated maturity caused by abrupt climatic alterations, resulting in fruit mature within whilst still green on the outside. The principal parasitic disease is brown rot caused by *Thielaviopsis* [*Ceratocystis*] *paradoxa* [*R.A.M.*, 28, p. 71] which enters chiefly through wounds on the surface of the fruit. During the sorting process the fruits are protected from [unspecified] stem rot by treatment with 1 per cent. boric acid plus a little methylene blue.

Graniti (A.). **Il mosaico del Fico in Italia e il suo probabile vettore.** [Fig mosaic in Italy and its probable vector.]—*Riv. Frutticolt.*, 16, 1, pp. 23–25, 1 pl., 1954. [English and Italian summaries.]

Fig mosaic in Italy [*R.A.M.*, 32, p. 423] is characterized by irregular pale green, transparent, or yellowish spots on all or part of a leaf, leaf distortion or rolling, necrosis of the veins and surrounding tissues, shortening of the twig internodes and rosetting, together with light green mosaic patterns on the young fruits. Surveys in Sardinia, Sicily, and Tuscany during the summer and autumn of the past two years revealed the presence on the undersides of fig leaves, particularly young ones, of the eriophid *Aceria ficus*, chiefly in spring and continuing to the end of November, but not in the height of summer. This mite is believed to be the vector of the virus, at least in Italy.

Tandon (R. N.) & Agarwala (R. K.). **Pathological studies of Gloeosporium psidii causing die-back of Guavas.**—*Proc. Indian Acad. Sci.*, Sect. B., 40, 4, pp. 102–109, 1 pl., 1954.

A detailed study was made of the wilt and die-back of guavas in Allahabad caused by *Gloeosporium psidii* [*Glomerella cingulata*: *R.A.M.*, 33, p. 243]. In the orchards of Minto Park, in 1952, trees died completely without fruiting or partly died, the ripened fruits bearing pinkish masses of acervuli. From June, 1952, to July, 1953, a fortnightly survey of the damage was carried out in several orchards. In June and July only old twigs were affected, but in August the young shoots began to die back, the disease increasing in severity up to the beginning of October. In severe cases flowering was prevented and under conditions favourable to the disease the main trunk was affected. The cool season of January to March and the hot, dry weather from April to June prevented the spread of infection.

From the twigs the fungus penetrates the petioles and attacks the young leaves, which become distorted with dead areas at the margins or tips, and in severe cases may die and fall.

Field and laboratory pathogenicity tests during both the rainy season and the summer showed that the fungus readily attacks young shoots, injured young leaves, and flowers and buds. Small flowers and buds sprayed with a spore suspension developed infection within two or three days and fell before fertilization, the petals turning brown. Inoculated stigmata turned brown after 24 hours; often the whole flower dropped within three to four days, but sometimes the infected ovary remained attached and developed into a mummified fruit. Healthy, ripened fruits in contact with diseased ones developed rot but did not become mummies. Fruits sprayed with a spore suspension were unaffected, whereas in those inoculated by Granger and Hornes's method (*Ann. Bot., Lond.*, 38, pp. 212–215, 1924), the fungus remained latent for up to three months, rot developing on ripening.

Cross-inoculations demonstrated the host specificity of the guava pathogen and related fungi on various *Citrus* spp. Three applications of 3–3–50 Bordeaux mixture and 0·22 and 0·33 per cent. perenox after removal of the dead twigs reduced losses to 6·6, 10, and 12 per cent., respectively, compared with 50 per cent. for lime-sulphur. Losses were about 15 per cent. higher when dead twigs were not removed.

Gustafson (C. D.). **Avocado soil fumigation.**—*Calif. Citrogr.*, 39, 11, p. 415, 1955.

Field and greenhouse tests by the Agricultural Extension Service, San Diego, California, in 1952 showed methyl bromide [*R.A.M.*, 34, p. 319] to be an effective soil fumigant against *Phytophthora cinnamomi* root rot of avocado [34, p. 381]. Treating diseased trees *in situ* is impracticable because of the damage done, but since the fungus can be spread to new areas through the potting soil used for seedlings, the fumigant could be used to sterilize such soil. Methyl bromide may also have

possibilities as a chemical barrier to isolate infected areas in an orchard but further work is needed before a recommendation can be made.

Malan (E. F.), Van der Meulen (A.), Loest (F. C.), & Stofberg (F. J.). **Avocado culture in South Africa.**—*Bull. Dep. Agric. S. Afr.* 342, 38 pp., 13 figs., 1 diag., 1955.

The information on pp. 31–36 of this bulletin, concerning diseases of avocados in South Africa, has already been noticed from another source [*R.A.M.*, 34, p. 532].

Cox (R. S.), Harrison (D. S.), & Yager (C. S.). **A versatile spray rig for small field plots.**—*Plant Dis. Reptr*, 39, 1, pp. 48–50, 4 figs., 1955. [Multilithed.]

A spray rig, readily adaptable for most vegetable crops on small field plots and easily manipulated, was developed at the Everglades Experiment Station, University of Florida, Belle Glade. The easily cleaned spray tanks are two ten-gallon stainless-steel milk cans set in frames, one on each side of the driver's seat; there is a 'John Bean No. 64 Junior Duplex' pump with a capacity of four gals. per minute and a pressure range of 0–400 lb.; and two single-row booms are mounted, one underneath the frame with a maximum ground clearance of 30 in., and the other as a side delivery or outrigger boom with a 72 in. clearance.

In experiments with maize and pepper the average number of plots (single 40-ft. rows) sprayed per hour was about 80. The apparatus is useful for studying the effect of dosage, nozzle type, and placement on disease control.

Marsh (R. W.). **Modern developments in research on fungicides.**—*J.R. Soc. Arts*, 102, pp. 555–572, 2 figs., 1 graph, 1954.

In this Fernhurst Lecture delivered to the Royal Society on 17th February, 1954, some aspects of recent developments in research on fungicides are discussed, all of which have been noticed from time to time in this *Review* [cf. *R.A.M.*, 33, pp. 158, 199, 437, 438 *et passim*].

Results of 1953 fungicide tests.—*Agric. Chemic.*, 9, 1, pp. 69–73, 131–133; 2, pp. 58–59, 61–62, 125, 127, 129; 3, pp. 57–62, 133, 1954.

Reports from the special committee on testing and results of newer fungicides set up by the American Phytopathological Society were formerly published in *Plant Dis. Reptr* [*R.A.M.*, 32, p. 577]. The present one contains the condensed results of 120 products used on 41 crop plants, summarizing the data from 75 contributors in the United States and Canada.

Starker (C.). **Dusting, spraying conference.**—*Agric. Chemic.*, 9, 12, p. 39–41, 111, 113, 1 fig., 1954.

At the sixth annual Washington Aerial Dusting and Spraying Conference, 26th–27th October, 1954, at Yakima, Washington, R. Sprague discussed the growing use of karathane for control of [apple] powdery mildew [*Podosphaera leucotricha*]; it is particularly useful on plants intolerant of sulphur, such as the variety Winesap. For application by aeroplane a 4 per cent. dust is recommended or a 2 per cent. dust for mixed varieties. Even a light epiphytotic of scab [*Venturia inaequalis*] can spread under favourable conditions, and 3 per cent. phygon has given good control, but is irritating to the skin. Captan (15 or 20 per cent.) or ziram (15 per cent.) dusts are recommended against pin-point scab. Manganese carbamate, an organic sulphur, is suggested as a 15 per cent. dust, but should be used with care on Rhome. Streptomycin for fireblight [*Erwinia amylovora*] control should be sprayed at full bloom, with two repetitions at intervals of ten days [*R.A.M.*, 34, p. 601].

Sulphur dust at 30 lb. per acre controls mildew on peas [*Erysiphe polygoni*] provided it is applied early, but 1 per cent. karathane dust is more effective.

Snow mould of winter wheat may be caused by various organisms [*Calonectria nivalis* and *Typhula* spp.: *R.A.M.*, 29, p. 255], being severest in March and April; fungicides should be applied before snow falls. A special ceresan preparation at 2½ lb. per acre in 10 gals. of water is suggested, with the dose doubled if the seed treatment type of ceresan is used.

A.C.S. Division of Agricultural and Food Chemistry hears talks on pesticides at Kansas City Session.—Abs. in *Agric. Chemic.*, 9, 4, pp. 65, 137–138, 1954.

Technical papers presented to members of the American Chemical Society at a meeting at Kansas City, Missouri, in the spring of 1954, included the following.

J. D. Wilson, on fungicide formulations as related to field performance, discussed the problems involved in formulating fungicidal compounds, which cannot usually be applied in their pure state, so as to obtain optimal results. Thus correct concentrations for greatest efficiency must be decided, a choice made between powders and liquids and the form which these will take, and whether wetting agents are desirable. Additives must be compatible with the active agent so as not to impair its physical state nor increase phytotoxicity.

F. E. Weick, on aircraft sprayers and dusters, gave general information on the numbers and distribution of operators, the main crops treated, and the types in use and requirements of agricultural aircraft. A measuring station is described for weighing the quantities of spray or dust and for determining the distribution pattern. Typical results are compared with optimum patterns and means for obtaining the latter are discussed.

McCallan (S. E. A.). **Isotopes, their use in fungicidal research.**—*Agric. Chemic.*, 9, 2, pp. 52–53, 119, 121, 1954.

In this talk given to the American Phytopathological Society on 7th September, 1953, the use of radio-active tracers in fungicide research [cf. *R.A.M.*, 33, pp. 39, 438] is outlined, nine references being given, most of which have been noticed in this *Review*. The author concludes that an increase in knowledge of the physiology of fungus spores and the effect of fungicides on their vital processes, gained by the employment of isotopes, may lead to the production of more efficient fungicides.

Garber (J. D.), Rothrock (J. W.), Reynolds (H. C.), & Gray (R. A.). **Agricultural streptomycin.**—*Agric. Chemic.*, 9, 12, pp. 32–34, 1954.

This report deals with trials relating to the agricultural uses of streptomycin [cf. *R.A.M.*, 34, p. 49], an important attribute of which is the apparent absence of residues. Many samples of pears, apples, peaches, beans, and tomatoes from plots treated with streptomycin were tested for the presence of antibiotics with negative results, e.g., tomatoes from a plot sprayed two weeks before harvest (220 p.p.m., 100 gals. per acre). In a laboratory experiment tomatoes were soaked in a 250 p.p.m. solution of streptomycin for two hours, after which the washed fruit, tested by assay, was found to contain 300 μgm. of antibiotic per 100 gm.; after ten days no antibiotic could be found. The ripening time allowed for green-picked tomatoes is, therefore, adequate for removing traces of streptomycin arising from late treatment. Insoluble forms of the antibiotic may be useful where slow absorption is preferable to a sudden high-level concentration or where surface activity and not systemic action is required.

Kampmeier (C.) & Haag (H. B.). **Toxicological considerations in use of dithiocarbamates.**—*Agric. Chemic.*, 9, 4, pp. 49–50, 133, 1954.

Dithane Z-78 (containing 65 per cent. zineb) and dithane D-14 (containing 19

per cent. nabam) were examined in regard to their toxic effect on agricultural workers and food consumers, and it was found that they offer no serious hazards, though nabam is a sensitizing agent which can irritate eye and skin. Zineb residues on treated food crops range from 0 to 13 p.p.m., amounts innocuous to the consumer.

Peterson (G. W.) & Buchholtz (W. F.). **Relative toxicity of legume seed protectants to two species of Rhizobium.**—*Iowa St. Coll. J. Sci.*, 29, 1, pp. 95–103, 1 fig., 1955.

In tests conducted to determine the relative toxicity of legume seed protectants to *Rhizobium* spp. [*R.A.M.*, 34, p. 123] ceresan M was found to be highly toxic, arasan and arasan SF intermediate, and spergon and wettable spergon of very low toxicity. *R. meliloti* was somewhat less sensitive to all fungicides than *R. japonicum*. It is thought that ceresan M and higher dosages of arasan and arasan SF may prove to be sufficiently toxic to *R. meliloti* and *R. japonicum* to inhibit nodulation.

Ludwig (R. A.), Thorn (G. D.), & Unwin (C. H.). **Studies on the mechanism of fungicidal action of metallic ethylenebisdithiocarbamates.**—*Canad. J. Bot.*, 33, 1, pp. 42–59, 14 graphs, 1955.

In a further contribution to this subject from the Science Service Laboratory, London, Ontario [cf. *R.A.M.*, 33, p. 740], the titration reactions between the sulphates of zinc, manganese, and iron and nabam were investigated. Manganese ethylene bisdithiocarbamate was water-soluble, converting on aeration to ethylene thiuram monosulphide, whereas the corresponding zinc salt was almost insoluble and was fungicidal only in dilute alkali. It is concluded that the mechanism of action of the zinc and manganese derivatives and probably the iron too is the same as that of nabam.

The behaviour of fungicidal dithiocarbamates in the field is explained by this work. The protective value of nabam is due to the stability and insolubility of ethylene thiuram monosulphide and its polymer, while the formation of a heavy metal salt increases the spray deposit and allows a longer oxidation period [cf. 34, p. 533].

Waksman (S. A.). **Perspectives and horizons in microbiology.**—220 pp., 4 pl., 16 diags., New Brunswick, Rutgers University Press, 1955. $3.50.

In this symposium are collected 13 contributions from distinguished international microbiologists under the sections (i) the microbe as a living system, (ii) metabolism of micro-organisms, and (iii) micro-organisms and higher forms of life. In the last section F. L. Horsfall (pp. 152–167) reviews the inhibition of virus reproduction by chemical substances, with 41 references. Challenging problems in antibiotic research (pp. 168–178) are discussed by H. Eagle, and R. L. Starkey (pp. 179–195) describes the relationships between micro-organisms and plant life (48 references). An appendix contains three addresses delivered by L. W. Jones, S. A. Waksman, and A. J. Kluyver at the dedication of the Institute of Microbiology, Rutgers University, on 7th June, 1954.

Kouyeas (V.). **On the sexuality of Phytophthora parasitica Dastur.**—*Ann. Inst. phytopath. Benaki*, 7, 1, pp. 40–53, 8 graphs, 1953.

In the Plant Pathology Laboratory, Agricultural College of Athens, 76 isolates of *Phytophthora parasitica* from six different hosts were examined for oospore production in both single strain and paired cultures [cf. *R.A.M.*, 11, p. 205; 33, p. 170]. Only 18 per cent. produced oospores during two to six months in single strain culture on Quaker oat agar. When the strains were paired on the same medium oospores appeared abundantly within 15 days in certain cultures, but not in others.

All the isolates used proved to be bisexual. The author considers sexuality in *P. parasitica* to be relative, resembling that in other members of the Oomycetes. Strains having the same sexual tendency were isolated almost constantly from the same host plant.

JØRGENSEN (E.). **A method for the study of mycelial anastomoses.**—*Friesia*, 5, 1, pp. 75–79, 3 figs., 1955.

An oil cell method is described from the Department of Plant Pathology of the Royal Veterinary and Agricultural College, Copenhagen, for the study of mycelial anastomoses in wood-destroying fungi [cf. *R.A.M.*, 31, p. 508]. Two square pieces, measuring 2 to 3 mm. in length and 0·5 mm. in depth, are cut from an agar culture of intact mycelium, placed in the concave depression in a glass slide, 76 by 26 by 1·5 mm., separated by a distance of 4 to 5 mm., and entirely covered with liquid paraffin. A cover-slip, 40 by 20 by 0·1 mm., is superimposed, causing the oil to spread beyond the edges of the depression and fixing the cover-slide and agar pieces in position. This procedure presents several advantages over the moist cell method used by other workers, being impervious to contamination by foreign organisms, resistant to desiccation, very expeditious, and well suited for microscopy and photography.

WUNDER (W.). **Report to the Government of Yugoslavia on investigations concerning the occurrence of Fish diseases in Yugoslav pond farms.**—*Rep. F.A.O.* 308, 17 pp., 9 figs., 1 map, Rome, 1954. [Mimeographed.]

One of the most serious diseases of carp, causing extensive mortality in Yugoslav pond farms, is gill rot caused by *Branchiomyces* sp., which occurs during the summer particularly following heavy fertilizing. The infection was followed by *Saprolegnia* sp. [cf. *R.A.M.*, 32, p. 557], after which the diseased tissue was shed. Gill rot may be avoided by not applying superphosphate during the hot weather, adding lime as a preventive, and removing decaying plant material from the ponds in the summer.

COOKE (W. B.). **Fungi in polluted water and sewage. I. Literature review.**—*Sewage industr. Wastes*, 26, 4, pp. 539–549, 1954.

The literature on fungi associated with sewage and polluted water [see next abstracts] is briefly reviewed from 41 titles, some of which have already been noticed [cf. *R.A.M.*, 33, pp. 246, 746]. It is concluded that new techniques need to be developed to induce the many fungi associated with these habitats to sporulate in order that they may be identified and their respective physiological requirements then ascertained.

COOKE (W. B.). **Fungi in polluted water and sewage. II. Isolation technique.**—*Sewage industr. Wastes*, 26, 5, pp. 661–674, 1954.

An account is given of the sampling technique for isolating and culturing fungi from sewage and polluted water [see preceding and next abstracts] and the characteristics of various media are discussed. One of the most efficient media for the purpose consisted of dextrose (10 gm.), phytone or soytone (5 gm.), potassium dihydrogen phosphate (1 gm.), magnesium sulphate (0·5 gm.), agar (20 gm.), water (1 l.), rose bengal (0·35 gm.), and aureomycin hydrochloride (35 μgm. per ml.).

COOKE (W. B.). **Fungi in polluted water and sewage. III. Fungi in a small polluted stream.**—*Sewage industr. Wastes*, 26, 6, pp. 790–794, 1954.

The fungus flora of a stream polluted with the effluent from a primary-type sewage plant [see preceding abstracts] in Clinton County, Ohio, was studied during

a twelve-month period [*R.A.M.*, 32, p. 205]. A total of 105 different fungi were found at eight points along the stream, of which 32 were common to all the sampling points and 26 found only at one. The six most widespread and tolerant species were *Aspergillus fumigatus*, *Geotrichum candidum* [33, p. 246], *Penicillium funiculosum*, *P. lilacinum*, *P. ochrochloron*, and *Trichoderma viride*. The inhibiting effect of the effluent was greater in warm weather, and extended further downstream in cold weather.

Todorović (M.). Нека лабораториска испитивања антагонистичког односа актиномицета према фитопатогеним бактеријама. [Laboratory investigations on the antagonistic relationship between actinomycetes and phytopathogenic bacteria.]—Зборн. Радова пољопр. Фак., Београд [*Rev. Res. Fac. Agric., Beograd*], 2, 1, pp. 49–55, 2 figs., 1954. [German summary.]

Of the 53 strains of actinomycetes examined in the laboratory at the University of Beograd, Yugoslavia, 35·8 per cent. were antagonistic in varying degrees to one, two, or more phytopathogenic bacteria [cf. *R.A.M.*, 33, p. 603]. Strain 32 (*Actinomyces globisporus flaveolus*) was antagonistic to all the bacteria tested, including *Bacterium* [*Xanthomonas*] *malvacearum*, *B.* [*X.*] *juglandis*, and *B.* [*Pseudomonas*] *lacrymans* and was the most active in producing antibiotics. The group of actinomycetes studied appears suitable for the isolation of antagonists against phytopathogenic bacteria and, possibly, other micro-organisms

Baldacci (E.). **Le malattie dello sviluppo nei vegetali in rapporto alle attuali conoscenze sulle sostanze di crescita.** [Diseases of plants during their development in relation to current knowledge of growth substances.]—*Atti Soc. ital. Pat.*, 3, 2, pp. 557–561, 1953. [Received 1955.]

The author describes and discusses the mechanism of analogous responses of plants to certain diseases or physiological disorders and to indoleacetic acid

Zamin Naqvi (S. H.). **The production of thiamine by Cercospora cruenta Sacc.**—*Canad. J. Bot.*, 33, 1, pp. 1–4, 1 fig., 1955.

At the Department of Biology, Queen's University, Kingston, Ontario, an isolate of *Cercospora cruenta* from *Vigna catjang* synthesized thiamine in a liquid medium containing inorganic salts and dextrose, in a similar manner to some species of *Pythium* [*R.A.M.*, 18, p. 268].

Saitô (T.). **The germination of fungus spores in relation to external conditions.**—*Ecol. Rev.*, 14, 1, pp. 75–80, 6 graphs, 1955.

Experiments at Tôhoku University, Sendai, Japan, demonstrated that spores of *Aspergillus glaucus* var. *tonophilus* were unable to germinate in dilute sucrose solutions below 1·4 M. but they did so in concentrated or saturated solutions. *A. niger* germinated both in the dilute and saturated solutions. None of the osmophilic fungi tested germinated in distilled water. Most germinated best at a relative humidity of 100 per cent., but for *A. g.* var. *tonophilus* the optimum was 90 to 97 per cent. *Cephalothecium* [*Trichothecium*] *roseum* germinated in the presence of up to 4 mM. copper sulphate, the germination rate decreasing as the concentration was increased.

Démétriadès (S. D.). **Études sur la biologie du Sclerotinia sclerotiorum (Lib.) Massee. III. L'action du magnésium et du soufre sur le développement du champignon et la formation de ses sclérotes.** [Studies on the biology of *Sclerotinia sclerotiorum* (Lib.) Massee. III. The action of magnesium and sulphur on the development of the fungus and sclerotial formation.]—*Ann. Inst. phytopath. Benaki*, 7, 1, pp. 15–20, 1 graph, 1953.

In a further contribution to this series [cf. *R.A.M.*, 34, p. 101 and next abstract]

it is stated that *Sclerotinia sclerotiorum* grown on a synthetic medium containing nitrogen, phosphorus, potassium, ferric chloride, and glucose, and lacking magnesium and sulphur yielded a dry weight amounting to only 50 per cent. of the control, the latter being on the same medium with the addition of 0·124 per cent. magnesium sulphate. Sclerotial formation ceased entirely [cf. 33, p. 547]. The use of a magnesium sulphate concentration equal to a tenth or double that of the control gave no dry weight increase nor did the use of magnesium or sulphur alone increase growth on the basic medium. However, when the two salts were combined so that there was the same quantity of each as in the control, growth equalled that of the latter.

Démétriadès (S. D.). **Études sur la biologie du Sclerotinia sclerotiorum (Lib.) Massee IV. L'utilisation de diverses sources d'azote.** [Studies on the biology of *Sclerotinia sclerotiorum* (Lib.) Massee. IV. Utilization of various nitrogen sources.]—*Ann. Inst. phytopath. Benaki*, 7, 1, pp. 27–35, 1 graph, 1953.

In this further contribution to the series [see preceding abstract] *Sclerotinia sclerotiorum* grown on quarter-strength Richards's solution with potassium nitrate as the nitrogen source rather than ammonium nitrate or sulphate yielded the highest dry weight and was therefore used as the control. Glycine, aspartic and glutamic acids, and tyrosine permitted growth equivalent to the control. Asparagine, leucine, and ammonium sulphate gave only 60 per cent., urea 50 per cent., and ammonium nitrate, cysteine, cystine, methionine, tryptophane, and valine did not exceed 35 per cent. of the control. Lysine inhibited growth very markedly and peptone was the best nitrogen source of all the substances employed.

Glycine, asparagine, aspartic and glutamic acids, tyrosine, peptone, and urea gave as many sclerotia as potassium nitrate; ammonium sulphate and nitrate and leucine produced very few, and cysteine, cystine, lysine, methionine, tryptophane, and valine inhibited sclerotial formation completely.

Hoffman (P. F.). **Physiology of Endoconidiophora fagacearum Bretz. I. Factors influencing growth and toxin production.**—*Iowa St. Coll. J. Sci.*, 29, 1, pp. 27–38, 6 graphs, 1954.

Endoconidiophora fagacearum [*Chalara quercina*: *R.A.M.*, 33, p. 267] was stimulated neither in growth nor toxin production, assayed by tomato cuttings, when cultures consisting of small volumes of liquid, with a large surface area relative to volume, were agitated, but growth was promoted when the volume of medium per flask was increased or 'richer' media were used. Sufficient toxin to cause incipient wilting of tomato cuttings appeared in liquid media by the eighth day and rapidly increased to the 26th day, when filtrates diluted to 6·25 per cent. contained sufficient toxin to produce complete wilt.

In buffered media, cultures adjusted to pH 4·2 and 5·1 made maximum growth while maximum toxin activity occurred at pH 3·4 and 4·2. The optimum temperature for growth was 20° C. Satisfactory media for growth were potato starch, dextrin, raffinose, *d*-glucose, maltose, *d*-fructose, sucrose, soluble starch, and inulin. Asparagine was superior to ammonium nitrate as a nitrogen growth source. Toxin production was the same on both materials. Of 25 nitrogen sources *l*-asparagine gave the best growth after 33 days' incubation but was no better than yeast extract, *l*-arginine hydrochloride, or peptone at the end of ten days' incubation.

Of six isolates of the fungus tested for their ability to synthesize vitamins, only one synthesized limited amounts of thiamin and another limited amounts of thiamin and biotin.

C. quercina grew readily on water extracts of oak chips and sawdust, but toxin assays were impossible because the uninoculated medium alone caused tomato

cuttings to wilt. Toxin activity in tomato and oak cuttings was directly correlated with increasing acidity. A toxin index of 10 was usually obtained below pH 4.

[Wade (G. C.).] **Potato diseases in Tasmania.**—*Tasm. J. Agric.*, 25, 3, pp. 240–252, 10 figs., 1954.

In this review of potato diseases and their control in Tasmania the following are regarded as the most important: potato viruses X and Y, the Up-to-Date and Bismark varieties being free from the former, potato leaf roll virus [*R.A.M.*, 27, p. 578], tomato spotted wilt, widespread, but of no great importance, black leg (*Erwinia atroseptica*) [cf. 33, p. 444], of general distribution but low incidence, scab (*Streptomyces* [*Actinomyces*] *scabies*), serious only in a few localities, powdery scab (*Spongospora subterranea*), unimportant except in wet, cold soils [28, p. 538], watery wound rot (*Pythium ultimum*), often destructive to the thin-skinned Bismark variety, pink rot (*Phytophthora erythroseptica*), occurring sometimes with the last-named, skin spot (*Oospora pustulans*), silver scurf (*Spondylocladium atrovirens*), dry rot (*Fusarium caeruleum*) [26, p. 123], which develops only in storage, blight (*Phytophthora infestans*), best controlled by regular sprayings with 4–2–40 Bordeaux mixture but not serious except under favourable seasonal conditions, early blight (*Alternaria solani*), not usually serious, wilt (*Verticillium dahliae*) [cf. 29, p. 333], *Colletotrichum* rot (*C. atramentarium*), which usually occurs at the heel end of the tuber, stalk break (*Sclerotinia sclerotiorum*), which was very prevalent in 1953–4 and is best controlled by crop rotation with cereals and grasses, black scurf (*Rhizoctonia* [*Corticium*] *solani*), for the control of which seed treatment with organic mercurials and crop rotations are recommended, 'fire blight' due to potassium deficiency [30, p. 120], controlled by applications of 1 to 2 cwt. per acre of potassic fertilizers, internal rust spot [cf. 28, p. 79], associated with particular varieties, and hollow heart.

The use of clean, virus-free seed and crop rotations, particularly with cereals and grasses, are recommended as general control measures for the above diseases.

Bonde (R.) & De Souza (P.). **Studies on the control of Potato bacterial seed-piece decay and blackleg with antibiotics.**—*Amer. Potato J.*, 31, 10, pp. 311–316, 2 figs., 1954.

In further experiments at the Maine Agricultural Experiment Station, Orono, in 1953, on the control of potato seed-piece decay caused by *Pseudomonas fluorescens* and black leg (*Erwinia atroseptica*) [cf. *R.A.M.*, 33, p. 444], seed-pieces were sprayed with black leg bacteria, placed in streptomycin sulphate solutions at 25 to 200 p.p.m. for 10 to 60 minutes, and planted in moist soil under glass. The 10-minute treatments were fully effective only at 200 p.p.m., while the 30- and 60-minute treatments inhibited decay and produced healthy plants at all concentrations, except for 60 minutes at 25 p.p.m., when there was slight superficial rot. When treatment was given before inoculation all concentrations up to 100 p.p.m. for all periods prevented decay and produced healthy plants. Slight decay occurring at 200 p.p.m. may have been due to phytotoxic injury. Control pieces soaked in water after inoculation showed progressively less decay and more healthy plants with longer treatment, but when soaking preceded inoculation there was considerable decay and dwarfing.

In another set of experiments seed-pieces were inoculated with *P. fluorescens*, *E. atroseptica*, and a mixture of both organisms, dipped for 30 minutes in solutions containing the same four concentrations of streptomycin sulphate, or of terramycin hydrochloride, or a mixture of both, and planted in the greenhouse. Streptomycin sulphate alone at any concentration practically eliminated decay, except when mixed inoculum was used; the rot, however, was superficial and insufficient to prevent the development of healthy plants. Terramycin hydrochloride did not

control *E. atroseptica*, though slightly inhibiting *P. fluorescens*. Mixed solutions eliminated decay caused by *P. fluorescens* and by combined organisms, but some decay remained if caused by the black leg organism alone.

In a field experiment 100 Kennebec seed-pieces, inoculated with *E. atroseptica* and treated with streptomycin sulphate (50 p.p.m. for 30 minutes), all produced healthy plants, whereas inoculated, untreated pieces mostly decayed and produced no normal plants.

Parker (M. M.), Akeley (R. V.), & Stevenson (F. J.). **Pungo : a new variety of Potato resistant to late blight and adapted to eastern Virginia.**—*Amer. Potato J.*, 31, 10, pp. 322–326, 1954.

The potato variety Pungo, resistant to late blight [*Phytophthora infestans*: *R.A.M.*, 33, p. 592], is recommended to growers in eastern Virginia, where it considerably outyields Irish Cobbler, especially at times of drought. In soil heavily infested with scab [*Actinomyces scabies*] 66 per cent. of the total yield of Pungo was marketable compared with only 14 per cent. for Irish Cobbler.

Niederhauser (J. S.), Cervantes (J.), & Servín (L.). **Late blight in Mexico.**—*Amer. Potato J.*, 31, 8, pp. 233–237, 1954.

The information contained in this article on breeding potatoes for resistance to blight (*Phytophthora infestans*) in Mexico has been noticed from a different source [*R.A.M.*, 34, p. 242].

Guntz (M.), Hascoet (M.), & Ventura (E.). **Influence de quelques produits fongicides sur le rendement de la Pomme de terre.** [The influence of certain fungicides on the Potato yield.]—*Phytiatrie-Phytopharm.*, 3, 4, pp. 173–180, 4 graphs, 1954.

In experiments carried out by the National Institute for Agronomic Research, Versailles, France, to determine the influence on potato yield of certain fungicides, replicate plots at Rethel (Ardennes), Braye en Laonnois (Aigne), and Vendrest (Seine-et-Marne), situations unfavourable to blight [*Phytophthora infestans*: *R.A.M.*, 29, p. 428], were planted with Bintje, susceptible and medium-early, Viola, less susceptible and slightly later, and Ackersegen, fairly resistant and late. Three treatments were given at Braye and Rethel and five at Vendrest because of heavy rain following two of the treatments. A 'pulvorex' sprayer applying 1,000 l. per ha. was used.

The yield, in weight, grouped according to localities and varieties, showed that Bordeaux mixture (5 kg. metallic copper per ha.) had a depressing effect which amounted to a yield loss of about 10 per cent. The effect of zineb (0·3 per cent.) and captan (0·5) could not be distinguished; their physiological influence on the plants is not constant, but there was no reduction in yield and under certain conditions, which have still to be established, it was increased. At Rethel a late attack of blight on Bintje and Ackersegen and a lesser one on Viola reduced the yield of the untreated and captan-treated plots. Bordeaux mixture and zineb gave better protection.

Ochoa (C.). **Species of Solanum (tuberarium) of South America. Present taxonomic status and species used in plant breeding with special reference to Peru.**—*Phytopathology*, 45, 5, pp. 247–250, 1955.

Information relating to current research on breeding for resistance to potato viroses and blight (*Phytophthora infestans*) [see next abstract] in South America, especially Peru [*R.A.M.*, 34, p. 54], is included in this paper, presented at the Symposium on Co-operative Agricultural Research in the Western Hemisphere at Madison, Wisconsin, on 9th September, 1953. The author is of the opinion that in Peru will

be found a greater diversity of genetical material in *Solanum* than elsewhere in South America, and that the country has as yet been insufficiently explored for wild types.

Heidrick (L. E.). **Late blight resistance—present status.**—*Phytopathology*, 45, 5, pp. 250–251, 1955.

Important new developments in the breeding of potatoes for resistance to *Phytophthora infestans* are outlined in this paper, presented at the Symposium on Co-operative Agricultural Research in the Western Hemisphere at Madison, Wisconsin, on 9th September, 1953. They include the use of wild species of *Solanum* from Central and South America [cf. preceding abstract] and studies on physiologic specialization within the fungus and on the nature of resistance in the host.

Relationship of Potato races of Phytophthora infestans and genes for resistance.—*Amer. Potato J.*, 31, 8, pp. 238–239, 1954.

From the results of co-operative studies on the races of *Phytophthora infestans* [*R.A.M.*, 33, p. 250], as discussed at the Potato Late Blight Symposium held by the Potato Association of America at Madison, Wisconsin, in 1953, the Association's Committee on Late Blight Investigation presents in tabular form the international system of designating interrelationships of genes and races already described [loc. cit.].

Jouin (C.). **Régularité de travail des appareils de traitement contre le mildiou de la Pomme de terre.** [Regularity of working of apparatus for treatment against Potato blight.]—*Phytiatrie-Phytopharm.*, 3, 4, pp. 159–166, 1954.

In laboratory and field tests undertaken in 1951 by the Central Station for Machinery Testing, Paris, on the uniformity of distribution of fungicides (liquids and dusts) for the control of potato blight [*Phytophthora infestans*: *R.A.M.*, 34, p. 477] in France it was found that the copper deposits from four machines very carefully regulated to distribute 5 kg. of copper per ha., actually varied from 2 to 8·5 kg. and that a single machine emitted varying amounts. The only recommendation that can be made is to the factories to improve construction methods and to the user to buy only well-recommended machines, and to keep the wear and tear of the machinery as low as possible.

De Lint (M. M.) & Meijers (C. P.). **Bestrijdingsproeven tegen de Aardappelziekte Phytophthora infestans (Mont.) de Bary.** [Control experiments against the Potato disease, *Phytophthora infestans* (Mont.) de Bary.]—*Landbouwvoorlichting*, 12, 6, pp. 269–278, 6 figs., 1955.

The results of further experiments in Holland in 1954, continuing those initiated by Ormel on the control of potato blight (*Phytophthora infestans*) [*R.A.M.*, 34, p. 242], are described and tabulated. Colloidal copper preparations, applied at the dosages recommended by the Phytopathological Service, were adjudged to be equally effective with copper oxychloride. Zineb conferred satisfactory protection on sandy soils, but copper compounds are preferable on clay, at any rate for all treatments after the first two. Haulm-killing with [sodium] arsenite (20 l. in 800 l. water per ha.) was profitable on clay but not on sandy soils.

De Haan (S.). **Compost en Aardappelschurft.** [Compost and Potato scab.]—*Landbouwvoorlichting*, 12, 7, pp. 315–320, 3 figs., 2 graphs, 1955.

In 16 out of 34 test years at the Agricultural Experiment Station, Groningen, Holland, the application of municipal refuse as a soil amendment at the rate of 100 tons [? per ha.] caused a slight increase in the incidence of potato scab [*Actinomyces scabies*]—much less than would be expected on the basis of the alkaline reaction induced by the treatment. The disease was almost or entirely absent in the other years covered by the trials.

Erwin (A. T.), Peterson (C. E.), Schaal (L. A.), & Edmundson (W. C.). **Osage : a new baking-type Potato variety resistant to common scab.**—*Amer. Potato J.*, 31, 10, pp. 299–304, 1 fig., 1954.

Osage (Colorado Seedling 6316), a long-white or baking-type potato, developed from a cross between USDA seedling X 245–186 and Katahdin, has shown high resistance to scab (*Streptomyces* [*Actinomyces*] *scabies*) [*R.A.M.*, 33, p. 555] in tests made since 1945 in several States. It is much more resistant than Irish Cobbler and Triumph, and compares favourably with Cherokee in resistance to scab, though not to late blight [*Phytophthora infestans*]. It has good cooking and storing qualities, but sprouts slowly and shows a tendency to develop hollow heart. Seed tubers should be warmed to break dormancy and spaced closely when planted.

Nickel (J. L.). **Results of Potato seed-piece treatment tests in Kern County, California.**—*Amer. Potato J.*, 31, 8, pp. 245–251, 1954.

The preliminary results are presented of tests conducted in 1951 and 1952, mainly in Kern County, California, to find an effective seed-piece treatment for potatoes [*R.A.M.*, 28, p. 471].

Some chemicals which decrease fungal decay, e.g., acidulated mercuric chloride used against *Rhizoctonia* [*Corticium solani*], are actually detrimental to the natural healing process. Chemical injury to the cut surface may enhance bacterial or physiological decay. Under favourable conditions strong disinfectants such as acidulated mercuric chloride may be used if the potatoes are planted within a day or two, but under adverse soil conditions they may be dangerous. Chemicals inadequate as bactericides may actually transmit bacterial diseases, e.g., ring rot [*Corynebacterium sepedonicum*] and black leg (*Erwinia atroseptica*), in the dipping vat. Effective treatment, however, can reduce the spread of such diseases to clean seed, though not preventing systemic infection resulting from the use of naturally infected tubers. Mercuric chloride at 1 : 500 plus 1 per cent. hydrochloric acid, used as an instantaneous dip, might adequately replace the usual pre-cutting two-hour tuber soaking provided the tubers are planted soon after dipping.

A high percentage of black leg infection resulted from inoculation with organisms from tubers with ring rot symptoms, indicating that *E. atroseptica* may be present as a secondary organism.

Błaszczak (W.). **Badania nad skutecznością działania środków dezynfekcyjnych (formalina, sublimat) na żywotność sklerot Rhizoctonia solani Kuehn.** [Studies on the effect of disinfectants (formaldehyde, mercuric chloride) on the viability of sclerotia of *Rhizoctonia solani* Kuehn.]—*Acta microbiol. polonica*, 3, 1, pp. 29–33, 1954. [Russian and English summaries.]

At Poznań, Poland, 3·3 per cent. of the smaller and 40 per cent. of the larger sclerotia of *Rhizoctonia* [*Corticium*] *solani* from potato [*R.A.M.*, 9, p. 801] remained viable after 1½ hours' treatment with 0·1 per cent. mercuric chloride as against 88·5 per cent. for the untreated. Longer periods of immersion gave, as a rule, better results, but none of the treatments completely destroyed all the sclerotia. The toxicity of this solution and that of cold formalin (0·8 per cent.) and of acidified mercuric chloride (0·2 per cent. plus 1 per cent. hydrochloric acid) [cf. 34, p. 541] were nearly equal.

Wilson (J. D.). **Late developments in Potato disease control.**—*Proc. Ohio Veg. Gr. Ass.*, 38, pp. 108–117, 1953. [Abs. in *Biol. Abstr.*, 28, 9, p. 2179, 1954.]

The results obtained by spraying potatoes [in Ohio] with new materials and by new methods in 1952 [cf. *R.A.M.*, 26, p. 166; 30, p. 625] are not considered to justify a change in earlier recommendations for disease control. Manzate [cf. 32, p. 327] proved to be a good spray for potatoes but cannot replace zineb compounds

completely, because of its higher cost. The latter were equally effective as tank-mix or wettable-powder formulations, though with manganese carbamate the tank-mix formulation was sometimes less effective than the wettable powder. Spray-tank mixtures of sodium dimethyl dithiocarbamate and zinc sulphate gave slightly better control of early blight of potato and tomato [*Alternaria solani*] than did the conventional wettable powder formulations.

Friedman (B. A.). **Association of internal brown spot of Potato tubers with hot, dry weather.**—*Plant Dis. Reptr*, 39, 1, pp. 37–44, 3 figs., 1 graph, 1955. [Multilithed.]

The symptoms, factors affecting, and etiology of potato internal brown spot, which was severe in New York and New Jersey in the drought years 1948, 1949, and 1953 [*R.A.M.*, 34, p. 59], are discussed with reference to the literature (78 titles). The disorder is considered distinct from corky ring spot which has not been recorded in the area, no ring-like symptoms being observed on affected tubers. The data, covering a six-year period, indicate that drought is more significant than high temperature alone, brown spot having been observed in hot, dry seasons but not during the hot, wet weather of 1952. The disorder has not been reproduced experimentally but the fact that it occurs in widely separated parts of the world under different growing conditions suggests that the symptoms may be induced by various conditions.

Ross (H.). **Über die Resistenz der Kartoffelsorten gegen das A-Virus auf der Basis Überempfindlichkeit. 2. Mitteilung : Pfropfversuche mit zwei verschiedenen Virus-A-Populationen und Feldinfektionsversuche.** [On the resistance of Potato varieties to the A-virus on the basis of hypersensitivity. Note 2: grafting experiments with two different virus A populations and field inoculation experiments.]—*Z. Pflanzenz.*, 34, 3, pp. 249–254, 1 graph, 1955.

In further experiments at the Max Planck Institute for Breeding Research, Voldagsen, Western Germany, on varietal reaction in potatoes to potato virus A [*R.A.M.*, 33, p. 497], hypersensitivity and consequent field immunity from infection were found in Adelheid, Benedikta, Carmen, Fichtelgold, Frühe Rosen, Imperator, Maritta, and Nova. Among the non-hypersensitive varieties, Virginia, Sieglinde, Apta, Olympia, and Heida were relatively resistant and Voran, Falke, Flava, and Capella comparatively susceptible. The average percentages of infection caused by viruses A and Y and leaf roll were 6, 7·4, and 63 per cent., respectively.

Miczyński (K. A.). **Badania nad zmiennością wirusa Ziemniaczanego 'X' pod wpływem ultradźwięku.** [Investigations on variations of Potato virus 'X' under the influence of ultrasound.]—*Acta. Soc. Bot. Polon.*, 23, 2, pp. 289–320, 2 pl., 2 figs., 8 graphs, 1954. [English summary.]

Studies were carried out at Cracow, Poland, on the effect of ultrasonic treatment on a necrotic strain of potato virus X [cf. *R.A.M.*, 34, p. 56] in infected tobacco sap extracts. Tobacco test plants inoculated with the treated sap often showed no symptoms, or only mosaic or mottle compared with the severe necrosis produced by untreated sap. These symptoms remained stable in further inoculations, suggesting mutation of the virus. Reduction in virulence depended on the duration of the treatment and the acoustical power of the apparatus. Even very strong ultrasound treatment did not completely destroy the virus protein which could still partially reproduce, complement fixation and precipitin tests yielding positive results although no symptoms developed on infected plants. Virus extracts were more sensitive to acoustical treatment and reacted more uniformly after partial purification than the crude sap.

The author suggests that changes in symptoms may be due to the selective action

of the treatment on the components of a mixture of strains of virus X rather than to real mutations.

Sprau (F.). **Pathologische Gewebeveränderungen durch das Blattrollvirus bei der Kartoffel und ihr färbetechnischer Nachweis.** [Pathological tissue changes in the Potato through the leaf roll virus and their demonstration by staining technique.]—*Ber. dtsch. bot. Ges.*, 68, 5–6, pp. 239–246, 1 fig., 1955.

The phloem necroses in potato plants infected with the leaf roll virus [*R.A.M.*, 27, p. 124] are not sufficient to account for the blockage of the sieve-tubes and accumulation of starch. In ageing plants there is a comparatively heavy formation of callose near the sieve plates which may entirely block them.

Tests with various dyes giving characteristic staining reactions with callose showed that the best material to use was a section through the tuber 'eye'. It was verified that indeed there are often significant differences between healthy and virus-affected plants, especially in older stolons and tubers. Stained sieve plates, it is true, are found also in healthy plants, especially in older stolons and tubers, but callose formation is much more marked in leaf roll-affected plants.

A dilution of 1 in 6,000 to 1 in 8,000 of corallin soda stained the callose plugs bright red, while the surrounding tissue showed little or no coloration. Isolated starch grains outside the cell were dyed red, too, but it was easy to wash them away. The stain faded after a week or two and the solution had to be renewed. Resorcin blue (1 part) in ammonia (0·1 to 0·5 parts concentrated in 100 of water) gave a bright blue colour in 30 to 60 seconds. Aniline blue (1 in 1,000) gave a good picture, though the blue is less bright than resorcin, as also did brilliant lacquer blue G.

For the possible diagnosis of virus infection only very rapid dyes like corallin soda and resorcin are suitable. Parallel tests were made by 'eye'-shoot examination and by dyes to determine the accuracy of leaf roll diagnosis. Of a total of 1,520 diseased and healthy tubers, 71 per cent. gave the same result in the two tests, 21 were mutually contradictory, and eight did not permit of a diagnosis.

Discussing the possible sources of the discrepancies, the author concludes that diagnosis by staining, though not sufficiently reliable for scientific purposes in general, may be useful for confirming doubtful 'eye'-shoot examinations.

Williams (A. S.) & Nielsen (L. W.). **Phellem as a diagnostic symptom of internal cork of Sweet Potato.**—*Phytopathology*, 45, 5, pp. 290–291, 1955.

In experiments at the North Carolina State College the presence of phellem round internal cork virus lesions in stored sweet potatoes was influenced by the prevailing temperature [*R.A.M.*, 32, p. 505] and the type of lesion. About half the root-knot nematodes with egg masses and the tunnels of all insect larvae were also entirely surrounded by phellem, which is, in fact, a host response delimiting a source of injury and develops round all wounds, not only those of internal cork. This absence of specificity minimizes the importance of phellem as a diagnostic symptom.

Straighthead in Rice.—*Rice J.*, 58, 8, p. 30, 1955.

Experiments carried out on fine, sandy soil near Eagle Lake, Texas, in 1954 showed that straighthead disease of rice [*R.A.M.*, 34, p. 317] was less severe when the soil was drained at about the jointing stage, but increased considerably when the draining period passed this stage. The draining of Century Patna 231 between 51 and 61 days after emergence resulted in normal yields and little or no straighthead. Bluebonnet 50 and Century Patna were less affected by the time of draining and produced the highest yields when draining was carried out between 66 and 76 or 36 and 61 days after emergence, respectively. Flushing fields of the three

above-mentioned varieties up to 71 days after emergence or to maturity also gave satisfactory yields. In a similar experiment at the Texas Rice Pasture Experiment Station on a Beaumont clay soil Century Patna and Century Patna 231 developed no straighthead.

Del Prado (F. A.). **Drie voor Suriname nieuwe Rijst-ziekten.** [Three Rice diseases new for Surinam.]—*Surinaam. Landb.*, 3, 3, pp. 222–223, 1955. [English summary.]

Since the publication in *Surinaam. Landb.*, 1, pp. 259–263, 1953, of a list of rice diseases encountered in Surinam, three more have been discovered, namely, stem rot (*Corticium solani*) on the SML 77/5/10/2 and 77/4/4/5 selections; smut (*Entyloma oryzae*) [cf. *R.A.M.*, 33, p. 280] on the Holland variety; and foot rot and 'bakanae' disease (*Gibberella fujikuroi*) [cf. 34, p. 251].

Young (H. E.). **Birds' eye leaf spot [of] Hevea caused by Helminthosporium heveae Petch.**—*Adv. Circ. Rubb. Res. Inst. Ceylon* 51, 3 pp., 1954.

In Ceylon, bird's eye leaf spot of *Hevea* rubber (*Helminthosporium heveae*) [cf. *R.A.M.*, 32, p. 397; 34, p. 543] is not usually of major importance, but sometimes retards the growth of plants in the nursery. Leaves that become infected when very young remain conspicuously distorted. The whitish centres of spots on leaves infected in the soft, light green stage tear readily and are often represented by holes in mature leaves. Immature leaf stalks and young shoots may also develop spots.

The spores may be produced within three or four days from the beginning of infection. They are readily wetted and carried about by dew or rain on the leaf surface, but appear to be carried only a few yards by wind, which probably explains the relative severity of infection in nurseries, where the plants grow close together, and the relative freedom from attack of plants in the field.

If a severe outbreak occurs, the nursery should be sprayed every week with Bordeaux mixture or a proprietary copper preparation until the course of the outbreak has been interrupted.

Venkataramani (K. S.). **'Dusting' as a measure of control of the abnormal leaf-fall of the Rubber tree.**—*Plant. Chron.*, 49, 19, pp. 513–516, 1954.

This is a review of the life-history of *Phytophthora palmivora* on rubber in India in relation to the timing and method of application of copper dusts for its control [*R.A.M.*, 34, p. 489].

Bottini (E.). **Gli elementi micronutritivi dei terreni italiani. Nota I. Il terreno e la pianta di fronte ai principali elementi micronutritivi.** [The minor nutrient elements in Italian soils. Note I. The soil and the plant in relation to the principal minor nutrient elements.]—*Ann. Sper. agr.*, N.S., 8, 2, pp. 519–548, 1954. [English summary.]

The author reviews, with 137 references to the literature, the present state of knowledge concerning the minor elements necessary for plant nutrition present in soils in different parts of the world [*R.A.M.*, 34, p. 483], the factors affecting their availability, the functions they perform in the physiology of plant life, plant abnormalities caused by deficiency or excess of them, and methods of supplying them to the plant.

Bottini (E.) & Polesello (A.). **Gli elementi micronutritivi dei terreni italiani. Nota II. La ricchezza dei nostri terreni in elementi micronutritivi assimilabili e non assimilabili.** [The minor nutrient elements in Italian soils. Note II. The content of our soils in available and non-available minor nutrient elements.] —*Ann. Sper. agr.*, N.S., 8, 2, pp. 549–574, 1954. [English summary.]

Of 48 soil samples from all parts of Italy analysed at the Experimental Station

for Agricultural Chemistry, Turin, 20 per cent. were extremely deficient or completely lacking in zinc. In all the samples boron was present in amounts adequate for the requirements of herbaceous crops, but at least 10 per cent. contained insufficient for fruit crops. Over 50 per cent. of the samples were deficient or completely lacking in molybdenum, while 10 per cent. were deficient in iron, 12 per cent. in magnesium, and 15 per cent. in sodium.

Only 4 per cent. of the samples contained an excess of zinc large enough to damage cereal production. In 15 per cent. copper was present in amounts that might prove deleterious to forage crops. In some samples from northern Italy the quantities of boron were large enough to injure tobacco and leguminous crops. Manganese and titanium were each present to excess in 10 per cent. of the samples.

Kline (C. H.). **Molybdenum opens new markets.**—*Agric. Chemic.*, 9, 9, pp. 42–45, 147, 8 figs., 1954.

This is a popular survey of the value of molybdenum [cf. *R.A.M.*, 32, p. 600] in improving the fertility of poor soils. The author reviews some crop improvements achieved outside the United States, describes the symptoms and identification of molybdenum deficiency, and the dangers of over-application on grazing lands. The rates of application corresponding to various soils and different types of molybdenum-containing mixtures are discussed. It is stated that the use of molybdenum in agriculture has passed from the initial research stage into that of large-scale application, and field experiments for the reclamation of unproductive soils continue in some 20 States.

Purvis (E. R.). **Commercial use and importance of heavy plant nutrients.**—*Agric. Chemic.*, 9, 11, pp. 36–38, 129, 131, 5 figs., 1954.

The application of trace elements to mineral-deficient soils has produced considerable increases in crop yields, which might encourage indiscriminate use of these nutrients. Continual cropping without any return of these elements has exhausted certain soils, while others were naturally deficient. Conversely, other areas possess adequate reserves and additional applications are pointless. Hence, preliminary soil analysis is of first importance. The author briefly reviews the developments in the use of copper, mainly applied as sulphate, iron, manganese, molybdenum, and zinc, whose importance as correctives of deficiency was recognized empirically long before the biological importance of these elements was understood. The geographical distribution of individual deficiencies is shown on maps, and estimated figures are given of the quantities of metal annually absorbed by crops, as well as of the amounts returned to the soil. Much waste of chemicals is due to the difficulty of diluting solutions so as not to exceed actual soil requirements.

Antognini (J.). **Iron chelates control iron chlorosis.**—*Agric. Chemic.*, 9, 11, pp. 47–49, 131, 1 fig., 1954.

The author discusses, on the basis of 18 references to the relevant literature, the causes of iron chlorosis, describes its symptoms and the crops affected, and explains the meaning and nature of chelates, the most widely used being iron ethylenediamine tetra-acetic acid (Fe EDTA). Products containing this chelate are listed and its application to various crops is described, with notes on residual effects and the reactions of treated crops [cf. *R.A.M.*, 33, p. 661].

McLennan (Ethel I.), Ducker (Sophie C.), & Thrower (L. B.). **New soil fungi from Australian heathland : Aspergillus, Penicillium, Spegazzinia.**—*Aust. J. Bot.*, 2, 3, pp. 355–364, 5 figs., 1954.

In this further contribution to the study of the fungus flora of an Australian heath soil [*R.A.M.*, 34, p. 179] five new species are described and figured, including

Aspergillus nutans, *A. viridi-nutans*, *A. unilateralis*, from the rhizosphere of *Epacris impressa* and *Hibbertia fasciculata*, and *Penicillium resedanum* and *Spegazzinia lobulata* from the rhizosphere of *Hibbertia fasciculata*, all from an acid, sandy podsol. Type cultures of each have been lodged at the Commonwealth Mycological Institute.

Saitô (T.). **The significance of plate counts of soil fungi and the detection of their mycelia.**—*Ecol. Rev.*, 14, 1, pp. 69–74, 1955.

Because the current methods of soil plating tend to the detection of fungus spores and give little indication of viable mycelium in soils, the following method was devised at Tôhoku University, Sendai, Japan, for extracting a piece of fungus mycelium from soil and growing it on an agar medium [cf. *R.A.M.*, 33, p. 501; 34, p. 546]. Fragments of moistened soil were spread in a thin layer on acid glucose-peptone agar. When a piece of mycelium was sighted, an agar disk bearing it was cut out with a cutter in place of the objective and transferred to a fresh plate from which the mycelium alone was picked up. By this method the author isolated mycelia of *Trichoderma lignorum* [*T. viride*], *Penicillium expansum* and other *P.* spp., *P. janthinellum*, *Mucor hiemalis*, *Phoma* sp., *Aspergillus niger*, *Macrosporium* sp., and *Dematium* sp. The specific gravities of certain mycelia were determined as 1·121 for *P. digitatum* and 1·131 for *T. koningi* [*T. viride*] and *Alternaria* sp.

Bunt (A. C.). **Steam pressure in soil sterilization. II. Glasshouse in situ sterilizing.**—*J. hort. Sci.*, 30, 1, pp. 43–55, 5 graphs, 3 diags., 1955.

In further work at the John Innes Horticultural Institution [cf. *R.A.M.*, 33, p. 561] trials under practical glasshouse conditions showed that thermal efficiency of steam sterilization varies inversely with the rate of injection (in lb. per unit volume of soil). The rate should not exceed 18 lb. steam per hour per sq. ft. of soil surface, that is 3·1 lb. weight per minute or a pressure of 2 lb. per sq. in. per standard Hoddesdon pipe spaced at 18 in.

Low-rate steaming saves from 1 to 3·5 lb. per cu. ft. of soil: the amount depends on the heat needed for the soil and the contrasts in rates used. With low-rate steaming, more time is required to reach sterilizing temperature. If, therefore, it is adopted without increasing the unit working area, only a part of the potential boiler output will be used, and the method would be more expensive.

In 'balanced steaming' the full boiler output is balanced against the area to be steamed and the method combines high thermal efficiency with maximum working rate. The economic importance of balanced steaming is seen from an example in which unbalanced low-rate steaming would involve an extra £90 labour costs per acre, while balanced steaming would save £16 per acre in fuel without extra costs.

Observations have shown that the customary method of covering the soil during sterilizing with tarpaulins to reduce the loss of steam is not efficient, especially when steam is used at a high rate. An inverted metal tray should prove more effective.

Claassen (C. E.). **Inheritance of sterility, flower colour, spinelessness, attached pappus and rust resistance in Safflower, Carthamus tinctorius.**—*Res. Bull. Neb. agric. Exp. Sta.* 171, 28 pp., 3 figs., 1952.

During 1948 and 1949 field experiments at the University of Nebraska College of Agriculture showed that in segregates from the Turkish variety of safflower, Yenice 1813 (N–804), resistance to rust (*Puccinia carthami*) [*R.A.M.*, 28, p. 309] was inherited as a single-factor difference. Highly resistant plants were also obtained from N–976 and N–977 from Rumania, N–2130 from Turkey, N–2555 from France, and N–2591 from Morocco. Resistance in all crosses was partially or completely dominant but results indicated that the genetic factors responsible are not all the same.

Muthana (M. A.). **Spike disease of Sandal (Santalum album).**—*Indian For.*, 81, 8, pp. 500–508, 1955.

The author traces the history, since 1893, of the spike disease of sandal (*Santalum album*) in Mysore State, India [*R.A.M.*, 34, p. 627]. The spread of the disease, its symptoms, and control are briefly described with frequent reference to the literature [most of which has already been noticed in this *Review*].

Stow (I.) & Ihara (K.). **On a new disease-germ of the Hop plant.**—*Proc. Japan Acad.* (formerly *Proc. imp. Acad. Japan*), 31, 5, pp. 294–299, 4 figs., 1955.

Corynebacterium humuli is the name proposed for a new species responsible for the previously described bacterial disease of the hop in Japan [*R.A.M.*, 33, p. 631]. It produces motile rods 0·5 to 0·7 by 0·7 to 2 μ with irregularly stained granules and 1 to 3, sometimes 8 or more, polar flagella. It is Gram-positive to variable, sometimes young and sometimes old cells being Gram-negative; non-capsulate and aerobic; not producing indole, hydrogen sulphide, or pectinase, but reducing nitrates; non-pigment producing on potato; non-active on cellulose; reducing methylene blue, litmus-milk, and tellurate; producing moderate acid but no gas from glucose, xylose, and mannose, but neither from sucrose, lactose, arabinose, maltose, rhamnose, galactose, fructose, melibiose, raffinose, dextrin, mannitol, glycerol, and starch, which is not hydrolysed. The optimum pH is 6 to 7·5 and temperature 25° C. Growth is completely checked at 37° and the thermal death point is 54° for 10 minutes.

In a supplementary note it is stated that the bacterium has been detected in the rootstocks and lower bines of healthy hop plants both cultivated and wild. Another bacterium also appears to be associated with the disease.

Talboys (P. W.) & Wilson (J. F.). **A method for determining the pathogenicity of strains of Verticillium albo-atrum isolated from the Hop.**—*Rep. E. Malling Res. Sta., 1953*, pp. 158–161, 1 pl., 1 diag., 1954.

A method was devised at East Malling Research Station, Kent, for testing annually the pathogenicity of a large number of isolates of *Verticillium albo-atrum* [*R.A.M.*, 33, p. 260] on hops under comparable conditions in the minimum space, without infecting useful land, and with very little risk of cross-inoculation occurring between different isolates. The plants were grown in pots in two rows of concrete and breeze-block tanks, each divided into units of four measuring 3 by 3 ft. by 16 in. internally and sloping to a central, gauze-covered sump-hole 6 by 6 by 4 in. Six isolates from a series of typical, long-standing outbreaks of wilt were obtained during 1952, maintained on prune-lactose-yeast agar under paraffin oil, and increased for inoculum on sterile, chopped hop bine. In March, 1953, the seven treatments, viz., soil inoculations with the six isolates and an uninoculated control, each consisting of 20 Fuggle N plants in pots in four-plant blocks, were set out in the tank units and bedded firmly in sand. Magnesium sulphate was applied to avoid simulation of wilt symptoms by magnesium deficiency and a screen erected to isolate infective material. By early July the inoculated plants fell into two groups, those inoculated with progressive isolates 1, 4, and P showing acute symptoms with general yellowing and extensive marginal and interveinal leaf necrosis, bine stunting, defoliation, and ultimate death of the aerial parts of the plant, and fluctuating isolates 2, 3, and F showing mild symptoms, sometimes in only one of the pair of bines, with some yellowing and sectorial necrosis of the leaves, mostly at the base of the plant. The control plants developed no symptoms at this stage, but some resembling those of mild wilt appeared later.

These results indicate that the above technique could be employed to determine the disease status of new wilt outbreaks in areas where immediate and drastic control measures are not required.

Кљајић (R.). Прилог познавању паразитне микрофлоре лековитих биљака на подручју Јавора. [A contribution to the knowledge of the parasitic microflora of medicinal plants in the Javor region.]—Зборн. Радова пољопр. Фак., Београд [*Rev. Res. Fac. Agric. Beograd*], 2, 1, pp. 119–133, 4 figs., 1954. [English summary.]

During a survey of plant parasites in the region at the foot of Mt. Javor, Serbia, Yugoslavia, in July, 1953, the following were recorded: *Septoria colchici* on *Colchicum autumnale* [*R.A.M.*, 33, p. 756], causing considerable leaf infection, *Alternaria daturae* [loc. cit.], *Datura* mosaic virus [cf. 23, pp. 219, 438], and *Phoma daturae* on *Datura stramonium*, *Gloeosporium cinctum* on orchids [cf. 24, p. 250], *Ramularia pastinacae* on wild parsnip [cf. 28, pp. 595, 643], *Exoascus rostrupianus* causing localized fruit deformity, *Phyllosticta prunicola*, infrequently observed on the leaves, and *Polystigma rubrum* [cf. 33, p. 262], causing slight infection all on *Prunus spinosa*, *Gymnosporangium juniperinum* on *Sorbus aucuparia* [cf. 32, p. 421], *Podosphaera myrtillina* on *Vaccinium myrtillus*, *Septoria verbenae* on *Verbena officinalis*, and *Ascochyta violae* on *Viola odorata*.

Sharma (S. L.) & Dube (H. D.). **Sphacelotheca on Erianthus munja.**—*Proc. Ind. Acad. Sci.*, Sect. B, 41, 1, pp. 16–19, 2 pl., 1955.

A preliminary description is given of a *Sphacelotheca* on *Erianthus* [*Saccharum*] *munja* which differs from *S. schweinfurthiana* [*R.A.M.*, 33, p. 562]. One form on the variety Bhikna Thoree [cf. 30, p. 80], collected in Champaran, India, in 1946, produces smutted arrows all the year round. Another form on N/4 from Raini, Muzzaffarpur District, found in 1950, occurs only in November and December. N/4 culms with smutted arrows attain a height of 300 to 360 cm., almost normal size and three to four times the size of the Bhikna Thoree form, the arrows of N/4 being broad and bushy, and those of Bhikna Thoree narrow and parallel. The sori and columellae on N/4 were larger but the spores were much smaller, being almost equal to those of *S. schweinfurthiana*. The two forms are considered to belong to the same species but there is a difference of opinion as to which species it is.

Frappa (M. C.). **Sur la présence de la maladie de Fidji dans les plantations de Cannes à Sucre de la côte est de Madagascar.** [On the presence of the Fiji disease in the Sugar-cane plantations of the east coast of Madagascar.]—*C. R. Acad. Agric. Fr.*, 40, 15, pp. 560–563, 1954.

The information in this paper has already been noted from another source [*R.A.M.*, 34, p. 107].

Lindquist (J. C.). **Notas uredinológicas III.** [Uredinological notes III.]—*Rev. Fac. Agron. Eva Perón*, 30, 1, pp. 59–64, 1954. [English summary.]

This further contribution to the series [cf. *R.A.M.*, 34, p. 257] contains notes on nine species, and includes records of new hosts, species new to Argentina, some emended determinations, and a description of one new species. *Puccinia microspora* on *Imperata cylindrica* was previously erroneously referred to *P. kaernbachii* [33, p. 689].

Losa España (T. M.). **Aportación al estudio de la flora micológica española.** [Contribution to the study of the mycological flora of Spain.]—*An. Inst. bot. A.J. Cavanilles* (formerly *An. Jard. bot. Madr.*), tomo 12 (vol. 1, *1953*), pp. 265–297, 13 figs., 1954.

This annotated list of fungi collected in the provinces of Burgos and Alava, Spain [cf. *R.A.M.*, 32, p. 102], chiefly in the Miranda de Ebro region [24, p. 387], includes *Sclerospora graminicola* on *Setaria viridis* [cf. 31, p. 209] and *Melampsora lini* on *Linum viscosum* and *L. catharticum* [C.M.I. map No. 68].

Bottomley (A[veril] M.) & Talbot (P. H. B.). **Common edible and poisonous Mushrooms in South Africa.**—*Bull. Dep. Agric. S. Afr.* 324, 49 pp., 20 col. pl., 1 fig., 1954.

In this bulletin 20 common species of agarics and boleti occurring in the Union of South Africa are briefly described, with notes on their edibility and a large colour drawing of each.

Sato (S.). **Uredinales collected in Mt. Zawô and Mt. Asahi-dake, Pref. Yamagata (2).**—*J. Jap. Bot.*, 29, 9, pp. 281–285, 1954. [Japanese, with English summary.]

In a further contribution to this series [*R.A.M.*, 34, p. 258] it is recorded that 67 species of Uredinales were collected from Mount Zawô and 71 from Mount Asahi-dake from 1947 to 1953. These include *Cronartium quercuum* on oak and *Aecidium mori* on mulberry.

Tubaki (K.). **Studies on the Japanese hyphomycetes (1) coprophilous group.**—*Nagaoa* (*Mycol. J. Nagao Inst.*), 4, pp. 1–20, 2 pl., 13 figs., 1954. [Received 1955.]

Sixteen species of coprophilous hyphomycetes isolated in Japan are described and illustrated, including two new ones.

Venkataramani (K. S.). **A leaf disease of nursery plants of the Silver Oak.**—*Plant. Chron.*, 49, 21, pp. 570–571, 1 fig., 1954.

Amphichaeta grevilleae has been found in several tea-growing areas in southern India, causing considerable damage to nursery plants of *Grevillea robusta* [*R.A.M.*, 34, p. 67]. The fungus is capable of a saprophytic existence on fallen leaves, which should be removed.

Wüstinger (G.), Schönfellinger (H.), & Broda (E.). **Distribution of radiocarbon in Tobacco mosaic virus.**—*Nature, Lond.*, 176, 4476, pp. 306–307, 1955.

Radio-active tobacco mosaic virus has been secured by exposing infected tobacco leaves to radio-active carbon dioxide for one day in light, treating the homogenized leaves with buffer solution, and purifying the virus by repeated precipitation at the isoelectric point [*R.A.M.*, 32, p. 699]. The specific radio-activity (activity per unit weight) of the virus decreases with increasing age, i.e., with increasing interval between infection and radiophotosynthesis. Further studies at the First Chemical Laboratory, University of Vienna, demonstrated that in general the fractional radiocarbon content of the virus protein increases markedly with age so that young, actively growing virus directs radiocarbon (i.e., carbon newly introduced into the leaf) into the nucleic acid relatively more efficiently than old virus. The specific activity of the nucleic acid carbon in week-old virus was calculated to be about 115 times larger than that of the protein carbon, but only 13 times larger in virus about ten weeks old.

Berkeley (G. H.). **Virus diseases of Tobacco in Ontario.**—*Lighter* (*Dep. Agric. Can.*), 24, 4, pp. 11–15, 1954.

The author describes in popular terms the tobacco virus diseases prevalent in Ontario, mosaic [*R.A.M.*, 31, p. 462] being the most contagious and tenacious, and makes recommendations for their control. Besides mosaic they comprise ring spot [33, p. 705], streak [30, p. 632], and etch [34, p. 18].

Chessin (M.) & Scott (H. A.). **Calcium deficiency and infection of Nicotiana glutinosa by Tobacco mosaic virus.**—*Phytopathology*, 45, 5, pp. 288–289, 1955.

Using essentially the same experimental procedures as already described in connexion with studies at the Montana State University on nitrogen deficiency in relation to tobacco mosaic virus in *Nicotiana glutinosa* [*R.A.M.*, 30, p. 493; 34, p.

326], the authors demonstrated a specific reduction in the numbers of lesions per unit area (expressed by a factor of 2·7 on the average) in calcium-deficient plants. The shortage appeared to lower the intrinsic susceptibility of the cells to infection rather than increase mechanical resistance to virus entry, since the use of an abrasive failed to eliminate the differences in this respect between calcium-deficient plants and those receiving a normal supply of the element.

Nour-Eldin (F.). **The effect of organic acids on Tobacco mosaic virus multiplication.**—*Phytopathology*, 45, 5, p. 291, 1955.

At the Department of Plant Pathology, University of California, Berkeley, applying the heat-ultracentrifuge-spectrophotometer virus assay procedure of Schlegel and Rawlins [*R.A.M.*, 32, p. 699] to disks of Turkish tobacco leaves inoculated with purified tobacco mosaic virus floated on solutions of various organic acids at a concentration of 0·003 M. in covered Petri dishes (15 disks per dish) maintained under a light intensity of about 170 foot-candles, the author demonstrated the following percentage increases in virus multiplication after five to six days: citric acid 20, 22, 19, 18, 21, 17, 23; α-ketoglutaric acid 17, 14; succinic acid 20, 24, 17; and malic acid 31, 27, and 27 [see next abstract].

Schlegel (D. E.) & Rawlins (T. E.). **A screening test of the effect of organic compounds on production of Tobacco mosaic virus.**—*J. Bact.*, 67, 1, pp. 103–109, 1954. [Received 1955.]

The amount of tobacco mosaic virus produced in floating leaf disks from inoculated tobacco in artificial light for 12 hours per day (300 foot candles at 4° to 5° C. above laboratory temperature) was almost double that produced in diffuse daylight (25 foot candles and laboratory temperature) at the Plant Pathology Department, University of California, Berkeley [cf. *R.A.M.*, 34, p. 187]. Glucose-1-phosphate, 6-methyluracil, propyl thiouracil, isocytosine, and glucose were the most effective in increasing virus production in diffuse daylight, while thiouracil, diazouracil, zinc chloride, and L-isoleucine were the most effective in inhibiting it in artificial light.

Kirby (R. S.). **Control of Tobacco wildfire with streptomycin preparations.**—*Plant Dis. Reptr*, 39, 1, p. 14, 1955. [Multilithed.]

In trials in Lancaster county, Pennsylvania, four sprays at weekly intervals of 100 p.p.m. agrimycin (15 per cent. streptomycin sulphate and 1·5 per cent. terramycin) plus ferbam (3 lb. per 100 gals.) prevented the development of tobacco wildfire (*Pseudomonas tabacum*) [*R.A.M.*, 34, p. 265 and next abstract] in the seedbed, and when applied to previously infected plants checked the spread of the disease; with 200 p.p.m. agrimycin in the mixture a full, healthy crop was obtained from plants originally 50 per cent. infected. The severity of blue mould (*Peronospora tabacina*) [34, p. 405] was also reduced.

Beach (W. S.) & Engle (H. B.). **Tobacco wildfire control by streptomycin nitrate.**—*Plant Dis. Reptr*, 39, 1, pp. 15–16, 1 fig., 1955. [Multilithed.]

Streptomycin nitrate (100 p.p.m. streptomycin) was tested at Landisville, Pennsylvania, for the control of tobacco wildfire (*Pseudomonas tabacum*) [see preceding abstract]. Four applications of 1 gal. per 10 sq. yds. at eight- to ten-day intervals, following artificial inoculation of susceptible Swarr-Hibshman seedlings resulted in normal vigorous growth and freedom from the disease, control being superior to that obtained with Bordeaux mixture [cf. *R.A.M.*, 34, p. 265].

Stephen (R. C.), Neas (I.), & Hunter (J. G.). **Towards a better cure.**—*Rhod. Tobacco*, 5, pp. 3–5, 1954.

The information in this article on the control of barn spot of tobacco (*Cercospora nicotianae*) in Southern Rhodesia has already been noticed [*R.A.M.*, 34, pp. 110, 552].

Govi (G.). **L'antracnosi ed il marciume nero dei frutti di Pomodoro.** [Anthracnose and black rot of Tomato fruits.]—*Ann. Sper. agr.*, N.S., 8, 2, pp. 455–465, 4 figs., 1954. [English summary.]

This account of tomato anthracnose (*Colletotrichum phomoides*) and black rot (*Phoma destructiva*) in Italy is an expanded version of a paper already noticed from another source [*R.A.M.*, 33, p. 567].

MacNeill (B. H.). **Colletotrichum root rot of greenhouse Tomatoes.**—*Plant Dis. Reptr*, 39, 1, pp. 45–46, 1955. [Multilithed.]

Colletotrichum atramentarium has caused sporadic outbreaks of root rot of greenhouse tomatoes in Southern Ontario [*R.A.M.*, 32, p. 543] since 1946, when a 60 per cent. loss in crop was reported in the Burlington–Aldershot area. In 1953, 15 to 90 per cent. of the plants in the same area were affected. Preliminary experiments at the Department of Botany, Ontario Agricultural College, Guelph, suggest that the severity of attack, especially on older plants, may be regulated according to the concentrations of the inoculum used and that the root rot in the above area was due to a very high level of inoculum in the soil. Successive croppings in the same greenhouse soil intensified the disease. Good control was obtained by steaming infested soil or by treatment with dowfume MC-2 at 4 lb. per 100 cu. ft. of soil. If a lower concentration (2½ lb.) is used the soil should be fumigated before each tomato crop.

[Wade (G. C.).] **Tomato diseases. Part I. Soil-borne diseases. Part II. Diseases of leaves, stems and fruit.**—*Tasm. J. Agric.*, 25, 1, pp. 26–31; 2, pp. 134–142 10 figs., 1954.

The following soil-borne tomato diseases occurring in Tasmania are listed in part I with annotations in popular terms on disease symptoms and control (principally by soil sterilization and crop rotation): damping-off due mainly to *Pythium ultimum*, *Phytophthora cryptogea*, *P. parasitica* [*R.A.M.*, 10, p. 413], the last two also causing foot rot, and to a lesser extent *Rhizoctonia* [*Corticium*] *solani*, which also damages roots and stem bases of older plants; *Verticillium* wilt (*V. dahliae*) [29, p. 333], the fungus remaining viable in the soil for at least four years; *Fusarium* wilt (*F. bulbigenum* [var. *lycopersici*: 33, p. 212]), predominantly in glasshouses, outdoor temperatures being too low for the development of the organism; and *Sclerotinia sclerotiorum* [23, p. 250], which is more common in field crops and in unheated glasshouses.

Part II deals with the virus, bacterial, and fungal diseases observed on tomatoes in Tasmania, including mosaic and spotted wilt viruses (infected plants should be removed on detection), cucumber mosaic virus for which hand-washing and glasshouse fumigation against aphids are recommended, bacterial canker (*Corynebacterium michiganense*), which appears to be controlled in the island by the fermentation method of extracting seed, bacterial spot (*Xanthomonas vesicatoria*), controlled by mercuric chloride seed treatment, leaf mould (*Cladosporium fulvum*), early blight (*Alternaria solani*) and late blight (*Phytophthora infestans*), against which copper sprays are used, and blossom-end rot. Symptoms and controls are described.

Lindquist (J. C.). **Las especies argentinas de Ravenelia.** [Argentine species of *Ravenelia*.] -*Rev. Fac. Agron. Eva Perón*, 30, 1, pp. 103–128, 1 pl., 2 figs., 1954. [English summary.]

The author describes with a key the 15 species of *Ravenelia* [*R.A.M.*, 31, pp. 355, 401] at present recorded in Argentina and gives a brief review of the taxonomy and morphology of the genus, which is confined to the Leguminosae and damages timber trees.

Hiratsuka (N.). **Materials for a rust flora of Eastern Asia (2).**—*J. Jap. Bot.*, 29, 12, pp. 373–376, 1954.

In this further contribution [*R.A.M.*, 31, p. 402] 20 rust fungi are listed including *Puccinia heeringiana* and *Gymnosporangium haraeanum* on *Chrysanthemum cinerariifolium* and *Pyrus pyrifolia*, respectively, both new hosts, and *Aecidium hydrangeae-paniculatae* on hydrangea, considered to be conspecific with *A. actinidiae*.

Giles (J. E.). **Desirable combinations of characters in F_1 hybrid Tomatoes for the glasshouse.**—*J. Aust. Inst. agric. Sci.*, 20, 4, pp. 238–242, 1 fig., 1954.

In hybridization experiments with glasshouse tomatoes carried out in the Mildura district, Victoria, Australia, Vetomold and the F_1 hybrids South Australian Dwarf (C strain) × Vetomold and Tatinter × Vetomold were outstanding for resistance to leaf mould (*Fusarium* [*bulbigenum* var. *lycopersici*: *R.A.M.*, 28, p. 52]), having, respectively, resistance ratings (on a scale of 0 to 10 for dead to healthy plants) of 9·8, 9·2, and 8·6. The resistance of the parent, Vetomold, appears to be a dominant character in the two F_1 hybrids. The evidence obtained demonstrated that in these two hybrids it was possible to obtain combinations of earliness, leaf-mould resistance, and high yields of smooth, first-grade fruit. The yields of the hybrids did not differ significantly from those of the parents, indicating that the combination of desirable characters was not accompanied by heterosis.

Waggoner (P.). **Radiation checks plant wilt.**—*Agric. Chemic.*, 9, 9, p. 86, 1954.

This is a brief, popular review of the author's experiments at the Connecticut Agricultural Experiment Station, New Haven, made in connexion with the Atomic Energy Commission. High dosages of X-ray radiation a few hours before inoculation with the [tomato] wilt *Fusarium* [*F. bulbigenum* var. *lycopersici*] left the test plants highly susceptible. A low radiation dose several days before inoculation increased resistance by 50 per cent. compared with untreated controls. High dosage and a long interval before inoculation produced almost complete immunity, but the high dosage had a stunting effect on the plant.

Pine (T. S.), Grogan (R. G.), & Hewitt (W. B.). **Pathological anatomy of bacterial canker of young Tomato plants.**—*Phytopathology*, 45, 5, pp. 267–271, 1 fig., 2 diags., 1955.

An intensive study at the Department of Plant Pathology, University of California, Davis, of serial sections of five-week-old Improved Pearson tomato plants inoculated with *Corynebacterium michiganense* through the cut roots or petioles demonstrated that infection originates in the spiral vessel elements of the primary xylem. After five days or more, however, bacteria were detected in pockets about the vessels, having moved through cavities in the thin primary cell walls to the intercellular spaces of the xylem parenchyma, and in some cases extending inwards to the internal phloem and pith [*R.A.M.*, 10, p. 415]. The expansion of the pockets in the phloem tissue was comparatively slow and occurred in the same way as in the xylem and pith parenchyma. No evidence was secured of extended longitudinal movement of the pathogen in the phloem tissues.

Toole (E. R.). **Red stain of Boxelder.**—*Plant Dis. Reptr*, 39, 1, pp. 66–67, 1955. [Multilithed.]

At the Delta Research Centre, Southern Forest Experiment Station, Mississippi, *Fusarium negundinis* was consistently isolated from box-elder (*Acer negundo*) showing red stain in the sapwood [*R.A.M.*, 3, p. 559]. This stain is very common in stands in the Mississippi Delta. Field inoculations showed that *F. negundinis* can cause red stain in living box-elder trees.

Schneider (I. R.) & Campana (R. J.). **Fungicide tests in 1954 for the control of Sycamore anthracnose.**—*Plant Dis. Reptr*, 39, 1, pp. 64–65, 1955. [Multilithed.]

In an experiment carried out in 1954 at the Illinois Natural History Survey tree plot at Champaign for the control of sycamore [*Platanus* spp.] anthracnose (*Gnomonia veneta*) [*G. platani*: *R.A.M.*, 34, p. 192], eight of the nine fungicides tested significantly reduced the percentage of infected leaves. Vancide 51 plus vancide sticker (2 qt. per 100 gals.), dithane Z-78 (2 lb.), and phygon (1 lb.) were more and tag 33 (½ pt.) less effective than in previous tests [32, p. 649], the percentages of infection being 5·3, 9·3, 12·5, and 16·2, respectively, compared with 37·5 for the untreated. Monsanto 4367 (¾ lb.) caused conspicuous chlorosis.

At Peoria, using applications of puratized agricultural spray (1 pt. per 100 gals.) in different spray schedules, the young leaf spray seemed at least as effective as the broken bud [loc. cit.], applications at the delayed dormant stage having no effect.

McMullen (L. H.), Drake (C. R.), Shenefelt (R. D.), & Kuntz (J. E.). **Long distance transmission of Oak wilt in Wisconsin.**—*Plant Dis. Reptr*, 39, 1, pp. 51–53, 1955. [Multilithed.]

At the University of Wisconsin, Madison, oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: *R.A.M.*, 33, pp. 125, 509; 34, p. 192, and following abstracts] was successfully transmitted by means of endoconidia carried by insects (mostly Nitidulidae) caged on wounded trees after being exposed to mycelial mats or laboratory cultures of the fungus. Wilt also developed in trees wounded between 15th May and 18th June without caging, many insects being collected from the wounds, particularly during the first three weeks in June.

Yount (W. L.), Jeffery (A. R.), & Thompson (H. E.). **Spores of Endoconidiophora fagacearum on the external surfaces of the body of Nitidulids.**—*Plant Dis. Reptr*, 39, 1, pp. 54–57, 1955. [Multilithed.]

The oak wilt fungus *Endoconidiophora fagacearum* [*Chalara quercina*: see preceding and following abstracts] was isolated at the Bureau of Plant Industry, Pennsylvania Department of Agriculture, Harrisburg, from the external surfaces of *Epuraea* spp. and *Colopterus niger*, collected from infected trees in late autumn and again in the spring. Of the 120 free-flying nitidulids collected from baited traps only two yielded cultures. The fungus remains viable for more than three months on insects stored at 9° C.

Thompson (H. E.), Hadley (B. L.), & Jeffery (A. R.). **Transmission of Endoconidiophora fagacearum by spore-infested Nitidulids caged on wounded healthy Oaks in Pennsylvania.**—*Plant Dis. Reptr*, 39, 1, pp. 58–60, 1955. [Multilithed.]

In experiments carried out by the Pennsylvania Department of Agriculture, Bureau of Plant Industry, on insect transmission of oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: see preceding and next abstracts] by exposing nitidulids to mats producing ascospores and then caging them on fresh wounds (axe cuts, bark bruises, and auger holes) on healthy trees, very few infections were obtained even under the most favourable conditions for infection, whereas 50 per cent. of the trees inoculated with masses of ascospores became diseased. Transmission by insects is regarded as inefficient and more complex than at first supposed.

Morris (C. L.), Thompson (H. E.), Hadley (B. L.), & Davis (J. M.). **Use of radioactive tracer for investigation of the activity pattern of suspected insect vectors of the Oak-wilt fungus.**—*Plant Dis. Reptr*, 39, 1, pp. 61–63, 1 diag., 1955. [Multilithed.]

In studies at Pennsylvania Department of Forests and Waters, on the activity

of sap-feeding beetles, mainly nitidulids, vectors of oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: see preceding abstracts] the insects were tagged with radio-active iodine 131 and released at the beginning and in the middle of May, 1954, in the centres of four test plots, each consisting of red and white oaks [*Quercus* spp. and *Q. alba*] wounded before and after release of the insects. Mycelial mats of the fungus from diseased trees were periodically distributed in these plots and the presence of the tagged insects on trees and mats was checked by means of portable scintillation counters.

In general, the insects were observed earliest and in the largest numbers on the nearest wounded trees, their number and incidence decreasing on wounds located at greater distances. There was little movement of insects from mats or wounds once they entered them until the sites became desiccated. The largest numbers of insects were found on wounds which had remained moist with fermenting sap and were contaminated by fungi and bacteria, there being no apparent relationship between the age or type of wound and its attractiveness. Mycelial mats were powerful insect attractants, two specimens of *Carpophilus sayi* being recorded on fresh mats placed a mile away across a valley from the nearest point of release.

Moriondo (F.). **Ricerche sulla Melampsora pinitorqua Rostr. in Italia. I. Comportamento dei semenzali di Pinus pinea alle infezioni di M. pinitorqua.** [Researches on *Melampsora pinitorqua* Rostr. in Italy. I. The reaction of *Pinus pinea* seedlings to infection by *M. pinitorqua*.]—*Ann. Sper. agr.*, N.S., **8**, 2, pp. 593–611, 2 pl., 7 figs., 1954. [English summary.]

Investigations at the Institute of Agricultural and Silvicultural Pathology of the University of Florence, Italy, of infection of *Pinus pinea* seedlings growing near Orbetello, by *Melampsora pinitorqua* [*R.A.M.*, 33, p. 646] showed that the attacks occurred on the shoots and caused necrosis of the infected tissues. If, however, the spread of the mycelium was arrested by cork barriers and the growing tip of the shoot remained at least partially connected with the roots, then in the areas where the original tissues had been killed regeneration of the phloem and wood took place. This process started in close proximity to the living phloem and wood and spread downwards towards the roots; it was probably induced and controlled by the activity of the shoot.

Quick (C. R.). **Ecology of the Sierra Nevada Gooseberry in relation to blister rust control.**—*Circ. U.S. Dep. Agric.* 937, 30 pp., 7 figs., 1954.

A study of the autecology of the Sierra Nevada gooseberry (*Ribes roezli*) with a view to its eradication for the control of white pine blister rust (*Cronartium ribicola*) [*R.A.M.*, 33, p. 455] in California revealed that the weakest point in its life cycle is the establishment of its seedlings. The gooseberry is most readily suppressed after any major disturbance of natural conditions such as logging or burning, and before the bushes bear fruit, or else many years after a major disturbance, when competition from other vegetation is considerable.

Gravatt (G. F.). **A root disease of Persian Walnut.**—*Rep. Nth. Nut Grs' Ass., 1953*, pp. 127–128, [? 1954].

Large numbers of dying Persian (English) walnuts (*Juglans regia*) in France and Switzerland and scattered trees in other southern European countries were noticed by the author on three recent visits. *Phytophthora cinnamomi* [cf. *R.A.M.*, 24, p. 295] is considered as the most probable cause of this serious disease, which is favoured by poor drainage conditions. It occurs too in the eastern half of the United States [loc. cit.], where *P. cactorum* also attacks black walnuts (*J. nigra*) in nurseries and has been reported on Persian walnut.

GRAVATT (G. F.). **The international Chestnut Commission and the Chestnut blight problem in Europe, 1953.**—*Rep. Nth. Nut Grs' Ass., 1953*, pp. 52–55, [? 1954].

During a visit to Spain and Portugal in 1953 [cf. *R.A.M.*, 31, p. 463; 32, p. 595] the author observed the procedure adopted for the control of chestnut ink disease, *Phytophthora* [*cambivora* and *P. cinnamomi*: 32, p. 523], namely, spraying the roots and base of the tree with a sticker and dusting with copper oxide or sulphate before replacing the soil. The treatment is repeated every five to seven years. A subsequent visit to France, Italy, Switzerland, and Yugoslavia confirmed the current distribution of chestnut blight [*Endothia parasitica*: 33, p. 646; C.M.I. map No. 66] in these territories. In Yugoslavia young durmast oak (*Quercus petraea*) was killed by *E. parasitica*, and in Italy *Q. pubescens* was observed to be killed and *Q. ilex* to be damaged to a minor extent by this fungus.

OSBURN (M. R.), PHILLIPS (A. M.), & PIERCE (W. C.). **Insects and diseases of the Pecan and their control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1829, 56 pp., 48 figs., 1954.

The revised edition of this bulletin [cf. *R.A.M.*, 19, p. 571] contains illustrated notes on the incidence, symptoms, and control of a number of diseases of pecan (pp. 27–45). Scab (*Cladosporium effusum*) [34, p. 580] is the most severe destructive agent of pecan in the south-eastern United States and southern Gulf Coast States and full instructions for its control by spraying coupled with appropriate phytosanitary measures and the use of resistant varieties are given. In the same areas trees are susceptible to rosette, caused by zinc deficiency [33, p. 269], best controlled by the application of zinc sulphate either as a spray or to the soil. Other diseases described as to symptoms and control include downy spot (*Mycosphaerella caryigena*), vein spot (*Gnomonia nerviseda*), leaf blotch (*M. dendroides*), brown leaf spot (*Cercospora fusca*), liverspot (*G. caryae* var. *pecanae*), and crown gall (*Bacterium tumefaciens*).

Bunch disease, of uncertain cause, is similar in appearance to rosette; no definite control measure is known. Minor troubles include wood rot from injured surfaces, powdery mildew (*Microsphaera alni*) [32, p. 342] and cotton root rot (*Phymatotrichum omnivorum*) [20, p. 394]. The latter infects pecan roots from Texas to the Pacific usually during the summer and can kill trees though they may live one or two seasons. No means of control is known and growers are advised not to plant pecans on infected land. A nursery blight of seedlings is caused by *Elsinoe randii* [31, p. 541]. Thread blight (*Pellicularia* [*Corticium*] *koleroga*) is sometimes found on crowded trees and *Gnomonia* leaf spot (*G. dispora*) on rosetted trees. *Cephalothecium* [*Trichothecium*] *roseum* on fruits causing 'pink rot' is referred to. Lichens are regarded as harmless and Spanish Moss (*Tillandsia usneoides*), though occasionally unsightly, is of little account on vigorous trees. Winter injury affects trees not yet dormant before freezing weather, and sunscald produces somewhat similar symptoms. Lightning injury is of fairly common occurrence and its effects may be mistaken for those of a parasitic disease.

SCHULDT (P. H.). **Comparison of anthracnose fungi on Oak, Sycamore, and other trees.**—*Contr. Boyce Thompson Inst.*, 18, 2, pp. 85–107, 5 figs., 1 graph, 1955.

This is a considerably expanded account of a study of *Gnomonia veneta* [*G. platani*] on various oak species and plane trees [*Platanus occidentalis*] and *Gloeosporium quercinum* on oak, American elm (*Ulmus americana*), and black walnut (*Juglans nigra*), a summary of which has already been noticed [*R.A.M.*, 32, p. 42].

NOBLES (MILDRED K.) & NORDIN (V. J.). **Studies in wood-inhabiting hymenomycetes. II. Corticium vellereum Ellis and Cragin.**—*Canad. J. Bot.*, 33, 1, pp. 105–112, 1 pl., 4 figs., 1955.

In a further contribution to this series [cf. *R.A.M.*, 33, p. 647] a cultural study

was made of *Corticium vellereum*, which is frequently isolated from *Acer saccharum* in Ontario [34, p. 3] but is not considered to be a primary cause of decay though it becomes established in wood already subjected to fungal attack. *C. vellereum* was frequently isolated from typical white rots although no diffusion zones were obtained in culture on media containing tannic or gallic acids. The decays from which *C. vellereum* was obtained were so variable that it is likely several species of fungi were involved. The fungus is heterothallic and tetrapolar.

Krstić (M.). **Jedan eksperiment inhibicije Schizophyllum commune Fr. na bazi antagonizma.** [An experiment on the inhibition of *Schizophyllum commune* on the basis of antagonism.]—*Zasht. Bilja* (*Plant Prot., Beograd*), *1954*, 25, pp. 42–44, 1 pl. (between pp. 48 and 49), 1954. [English summary.]

In *in vitro* experiments at the Institute for Scientific Research in Forestry, Beograd, Yugoslavia, *Penicillium crustaceum* was found to be antagonistic to *Schizophyllum commune*, one of the most important fungi causing decay of beech in Yugoslavia [*R.A.M.*, 33, p. 189]. Similar inhibition was also observed on beech wood itself.

Keller (H.). **Aus dem phytopathologischen Auskunftsdienst.** [From the phytopathological information service.]—*Allg. Forstz.*, 10, 5, pp. 52–54, 1 graph, 1955.

Of the 174 enquiries which the information service of the Forest-Botanical Institute, Munich, received in the course of 1954 from all over the southern part of Western Germany, 64 per cent. concerned fungus diseases.

Heavy damage to pines was caused by an epiphytotic of *Lophodermium pinastri* [*R.A.M.*, 32, p. 526], due largely to the mistake of placing pine nurseries or young plantings near or in old pine forests. Fairly extensive damage was caused also by the root fungi, *Fusoma parasiticum* [*Fusarium oxysporum* var. *aurantiacum*] and *Rhizina inflata* [cf. 33, p. 457], against which soil sterilization by steam is recommended. Extensive commercial losses of spruce were caused by *Agaricus melleus* [*Armillaria mellea*: 34, p. 6]. *Phomopsis pseudotsugae* [32, p. 651] was recorded on Douglas fir [*Pseudotsuga taxifolia*] in a district in Upper Bavaria.

Unspecified damage to plants resulted from overdoses or overconcentrations of fungicides, but these constitute less of a problem than the harm done by chemicals intended for weed-killing or as deterrents for animals. Alarming damage was caused to coniferous forests of all ages in certain areas by industrial fumes [32, p. 394], especially sulphur dioxide.

Vámos (R.). **A Fenyöcsemete dölése.** [Damping-off of Pine seedlings.]—*Erdö*, 3, 1–2, pp. 34–40, 1954. [Abs. in *For. Abstr.*, 16, 3, p. 386, 1955.]

The results of pot experiments [in Hungary] suggest that damping-off of nursery seedlings of *Pinus nigra* and *P. sylvestris* is associated with factors leading to anaerobic conditions in the rooting zone and interference with the normal metabolism of the plant. It failed to develop in sandy soil, even when inoculated with *Fusarium* isolated from the roots of affected plants [*R.A.M.*, 24, p. 481], but almost totally destroyed seedlings in clay soil, garden compost, or sand combined with more than 50 per cent. clay. The rhizospheres of affected plants were densely populated with bacteria and the plants themselves contained 15 to 30 per cent. less nitrogen and potassium than healthy ones and showed symptoms of phosphorus deficiency [24, p. 215]. Symptom expression was delayed by conditions preventing bacterial proliferation and measures to improve soil ventilation.

Gibson (I. A. S.). **Potassium permanganate as a seed bed treatment against damping off in Pines.**—*E. Afr. agric. J.*, 20, 3, pp. 176–177, 1955.

Details are given of five experiments in the glasshouse, frame, laboratory, and

nursery carried out in Kenya in which seeds of *Pinus patula* and *P. radiata* were sown and covered with soil known to contain the causal agents of damping-off. Diseased plants in all experiments regularly yielded *Rhizoctonia* [*Corticium*] *solani* and *Pythium ultimum* [cf. *R.A.M.*, 23, pp. 50, 196]. To each plot 0·6 per cent. solution of potassium permanganate was applied [6, p. 451] at the rate of 1 gal. per 2 sq. yds., treatment being given once every two days in the small experiments and once weekly in the nursery. No indication of disease control was obtained in any experiment, while in two out of three with *P. patula* losses were markedly increased. There was no evidence of phytotoxic effect, but the treatment increased the pH value of the soil from 6·8 to 7·8. In three small field trials carried out on forest stations under conditions of normal practice no improvement in seedling populations resulted from potassium permanganate treatment.

Edén (J.). **Träskyddets betydelse med speciell tanke på byggnadsvirke.** [The importance of wood preservation, with special reference to structural timber.] *Norsk Skogindustri*, 9, 2, pp. 56–61, 1955. [English summary.]

This is a useful international survey of up-to-date information on the practical and economic aspects of timber preservation against [unspecified] fungal rots and insect pests.

Røed (H.). **Sopp og tremasse.** [Fungi and mechanical wood pulp.]—*Norsk Skogindustri*, 9, 4, pp. 123–131, 5 figs., 1955. [English summary.]

Valuable information is summarized on the etiology of contamination of mechanical wood pulp by blueing and rotting fungi in Norway [*R.A.M.*, 34, p. 332] and its control by stringent sanitary precautions and treatment with organic mercurials. Besides a number of organisms already reported in the same connexion in this *Review*, mention is made of two more agents of timber decay, one identified by Robak as *Corticium calceum* [21, p. 357] and the other by the author as *Flammula spumosa*, which grows on half-rotted conifer branches and is fairly common in old sawdust and the like.

Canova (A.). **Marciume della Barbabietola da Rhizopus arrhizus Fischer.** [A rot of Sugar Beet caused by *Rhizopus arrhizus* Fischer.]—*Ann. Sper. agr.*, N.S., 8, 2, pp. 447–454, 3 figs., 1 graph, 1954. [English summary.]

In the summer of 1952, *Rhizopus arrhizus*, not previously recorded in Italy, attacked sugar beets [cf. *R.A.M.*, 10, p. 426; 22, p. 508] in the provinces of Ravenna and Pesaro. It was evident that the fungus had penetrated the collar (presumably through superficial injuries), spread into the petiole, and after killing the aerial parts had attacked the root. As infection spread downwards in the underground part the tissues turned dark and spongy, white, later dark, mycelium appearing on the surface. The affected plants occurred singly or in small patches and losses of up to 15 per cent. of the crop were sustained.

Inoculations of roots of sugar beet with cultures of the fungus gave positive results, the organism being reisolated from the infected material. High temperatures retarded pectinase production [cf. 2, p. 464] by the fungus.

Roland (G.). **Note préliminaire sur la lutte contre la jaunisse du Navet.** [Preliminary note on the control of Turnip yellows.]—Reprinted from *Rev. Agric., Brux.*, 7, 4, 4 pp., 1954.

In the first of two experiments at the State Phytopathology Station, Gembloux, Belgium, two sowings of turnips made on 14th April and 21st May had contracted by 1st and 22nd July, respectively, 2 and 2·5 per cent. turnip yellows virus [*R.A.M.*, 34, p. 422] and 7 and 3 per cent. turnip mosaic virus [32, p. 294; 34, p. 423]. These served as virus sources for the second experiment in which sowings of Rose Plat

Hâtif de Paris were made alongside the whole length of the first experiment, on 17th July, 3rd and 17th August, and 3rd September. On 1st December the percentages of yellows were, respectively: unable to be assessed, 13, 8, and 6; and of mosaic 40, 37, 20, and 6, and the corresponding percentage mean root weights were 100, 64, 63, and 21. It appears, therefore, that if virus attack is reduced by delaying the sowing date the gain will be offset by a corresponding reduction in yield.

Wilson (J. D.), John (C. A.), & Myrice (Ferris). **Ohio MR 25, a pickling Cucumber highly tolerant to mosaic.**—*Res. Circ. Ohio agric. Exp. Sta.* 25, 8 pp., 2 figs., 1954.

This is an expanded account of information already noticed from another source [*R.A.M.*, 33, p. 700].

Hamlyn (Brenda M. G.). **Aphid transmission of Cauliflower mosaic on Turnips.**—*Plant Path.*, 4, 1, pp. 13–16, 1 pl., 1955.

Symptoms of cauliflower mosaic virus on turnips [*R.A.M.*, 33, p. 407] usually take two to four weeks to appear in the glasshouse and their development varies with the age of the plant and the conditions of growth, young turnips sometimes being killed, though older plants may only bear necrotic or chlorotic local lesions. In transmission experiments at Rothamsted Experimental Station with *Myzus persicae* and *Brevicoryne brassicae* [34, p. 691] stock cultures of the virus were kept in turnip plants and young seedlings were used for the transmissions. When previously fasted aphids were given 2 to 15 minutes' feeding, both vectors transmitted the virus to about the same proportion of test plants; with infection feeds of 30 seconds both transmitted less frequently, but *M. persicae* infected twice as many plants as *B. brassicae*. When placed on a leaf after fasting, *M. persicae* made several punctures of short duration after 20 to 30 seconds, but several minutes often passed before *B. brassicae* made a puncture. *B. brassicae* usually fed in one position for a longer time than *M. persicae*.

In experiments with *M. persicae* alone, a period of preliminary fasting in some cases increased the amount of infection obtained, but in others did not. There was some evidence of response to fasting-times of 15 and 30 minutes, but the response was smaller than that obtained with most other non-persistent viruses. The acquisition period varied from 30 seconds to 24 hours. This irregular behaviour [cf. loc. cit.] distinguishes the virus from others of the non-persistent type. In similar experiments made on earlier occasions with cabbage black ring spot virus, using the same vector and host [33, p. 192], no such irregularities occurred. It is concluded that the irregularity is an attribute of cauliflower mosaic virus itself, and not directly of the host or vector.

Block (S. S.), Stearns (T. W.), Stephens (R. L.), & McCandless (R. F. J.). **Mushroom mycelium. Experiments with submerged culture.**—*Agric. Food Chem.*, 1, 14, pp. 890–893, 9 figs., 1953.

In co-operative experiments by the Department of Chemistry, University of Florida, and the Engineering and Industrial Experiment Station, mycelium of the wild mushroon, *Agaricus blazei*, was grown in submerged culture on orange juice, citrus press water (a waste product after citrus juice extraction), and synthetic media. The citrus press water, a potential, cheap medium in large supply, proved to be suitable, either fresh or after refrigeration, for the fungus. However, when the mycelium was dried and processed as a food it lacked the true mushroom flavour [cf. *R.A.M.*, 34, p. 624], but it is suggested that its bland flavour might enable it to be used for the preparation of vitamin B and amino acid concentrates for pharmaceutical purposes.

Ruizhkova (Mme A. S.). Повишение устойчивости рассады Капусты против заболевания сосудистым бактериозом [Increase of resistance in Cabbage seedlings to infection by vascular bacteriosis.]—Агробиология [*Agrobiology, Moscow*], *1954*, 6, pp. 144–146, 1954.

At the Pan-Soviet Scientific Research Institute of Agricultural Microbiology, Moscow, U.S.S.R., experiments were carried out to determine the effect of nutritional status on resistance in cabbage to *Xanthomonas campestris* [*R.A.M.*, 31, p. 157]. The variety Amager was grown in water culture for 12 days, then on Pryanishnikov complete nutrient mixture or modifications of it. The plants were inoculated on the 34th day with a bacterial suspension applied to a wounded leaf surface.

The results indicate that plants grown in complete nutrient mixture had comparatively less infection (a few points with small, moist spots). An increase in infection (darkening of the vessels) occurred in the absence of phosphorus and even more so (greater part of the leaf affected and the vessels, full of bacteria, begin disintegrating) with no potassium. Adding a triple dose of nitrogen to the complete nutrient resulted in the highest degree of infection (most of the leaves covered with dark, moist spots, vessels and petioles lose their elasticity, the leaf droops and finally dies).

Further experiments showed that seedling susceptibility is definitely dependent on the balance of nutrient elements supplied and that changing the correlation has a direct influence on seedling resistance. The following proportions of nitrogen, phosphorus, and potassium in the Pryanishnikov mixture resulted in no infection: $\frac{1}{4}$–$\frac{1}{4}$–$\frac{1}{4}$, $\frac{1}{4}$–$\frac{1}{4}$–2, $\frac{1}{4}$–2–$\frac{1}{4}$, 2–$\frac{1}{4}$–2, and $\frac{1}{10}$–$\frac{1}{10}$–1.

Vasiljević (L. A.). **Pythium butleri Subramaniam,** као проузроковач полегања расада [*Pythium butleri* Subramaniam, as the causal agent of seedling damping-off.]—Зборн. Радова пољопр. Фак., Београд [*Rev. Res. Fac. Agric., Beograd*], 2, 1, pp. 112–118, 4 figs., 2 graphs, 1954. [French summary.]

In further studies on seedling damping-off in Yugoslavia [cf. *R.A.M.*, 31, p. p. 216] *Rhizoctonia* [*Corticium*] *solani* [loc. cit.] in association with *Pythium aphanidermatum* was found to cause pre-emergence losses of cabbage [cf. 31, p. 526], [chilli] pepper [cf. 30, p. 446], eggplant [loc. cit.; 32, pp. 115, 124, 390], and *Pelargonium* seedlings. *P. aphanidermatum* is probably of secondary importance and does not cause serious damage.

Kišpatić (J.) & Milatović (I.). **Ispitivanje zdravstvenog stanja sjemena Šećerne Repe.** [Investigation on the health condition of Sugar Beet seeds.]—*Zasht. Bilja* (*Plant Prot., Beograd*), *1954*, 26, pp. 27–30, 1954. [German summary.]

The results of the studies at the Faculty of Agriculture and Forestry, Zagreb, Yugoslavia, indicate that both the filter paper and the malt agar methods are useful for studying infection of sugar beet fruit clusters [cf. *R.A.M.*, 32, p. 4; 34, p. 69]. The former method, however, is preferable for identifying *Phoma betae* [30, p. 507], particularly in seeds highly infected with *Alternaria* sp. which, on malt agar, often overgrows *P. betae*.

Tverskoi (D. L.). Опыт протравливания семян Сахарной Свеклы против корнееда. [An experiment on sterilizing Sugar Beet seeds against black leg.] —Агробиология [*Agrobiology, Moscow*], *1954*, 6, pp. 91–96, 1954.

At the Moscow Station of the Pan-Soviet Institute of Plant Protection, U.S.S.R., from 1946 to 1950, inclusive, various seed treatments were tested for the control of sugar beet black leg disease due to *Phoma betae* [*R.A.M.*, 32, p. 4], *Pythium debaryanum* [loc. cit.], *Rhizoctonia* [*Moniliopsis*] *aderholdi* [cf. 33, p. 572], and

Aphanomyces cochlioides [cf. 33, p. 291]. Of all the fungicides tested granosan (NIUIF–2, 5 gm. per kg. dry seed) was the most effective and most economical, reducing the percentage of seedling infection with *Phoma betae* (infected seedlings in sterilized soil), *Pythium debaryanum*, and *M. aderholdi* (both in infested soil) from 68, 90, and 77 in the untreated, respectively, to 20·7, 24·7, and 27·6.

In naturally infested, degraded, black soil seedling infection was reduced from 67·3 (untreated) to 17·2 per cent. and in podsolized clay from 88·9 to 46·4. The above-mentioned dosage of granosan was unsuitable for sugar beet seed treatment prior to soaking or vernalization. For acid podsolized soil the maximum dosages for seeds to be soaked and vernalized should be 3 and [? less than] 2 gm. per kg. dry seed, respectively. Granosan was less effective for *A. cochlioides* as it did not penetrate the upper soil layers where the fungus is found.

Malmus (N.). **Internationale Zusammenarbeit auf dem Gebiet der Erforschung und Bekämpfung der Cercospora.** [International co-operation in the field of *Cercospora* investigation and control.]—*Pflanzenschutz*, 6, 12, pp. 164–165, 1954.

An international commission to investigate control of *Cercospora* [*beticola*] on sugar beet [cf. *R.A.M.*, 34, p. 504], appointed at the instigation of the International Beet Research Institute, Brussels, met twice in 1954. Detailed information on the distribution and control of the disease in various countries was pooled and is here briefly summarized.

Dunleavy (J.). **Control of damping-off of Sugar Beet by Bacillus subtilis.**—*Phytopathology*, 45, 5, pp. 252–258, 3 graphs, 1955.

At the Nebraska Agricultural Experiment Station a dilution of 10^{-3} of dried cells of *Bacillus subtilis*, isolated from soil adhering to sugar beet, wheat, and safflower roots, inhibited the growth on nutrient agar of a species of *Rhizoctonia* causing severe damping-off of sugar beet [*R.A.M.*, 32, p. 414]. The antibiotic produced by the bacterium [cf. 31, pp. 271, 395; 34, p. 665] was more stable during autoclaving at pH 4 than at pH 7 and was not sensitive to light. The addition of a carbohydrate to the medium stimulated production of the antibiotic, which also developed on water agar containing manure. Its most active fraction was extracted with n-butanol. Inhibition of the pathogen by the bacterium was promoted by low and retarded by high temperatures, and the amount of manure in the soil determined the extent of the process. The addition of a high-nitrogen nutrient solution to a non-sterile soil improved the control of damping-off.

Olgyay (M.) & Lehoczky (J.). **A borsófajták Ascochytás Érzékenysége, fungicidek stimuláló hatása és permetezés.** [*Ascochyta* susceptibility of Peas, stimulating effect of fungicides and spraying.]—*Agrártud. egy.*, 17, pp. 113–126, 1 diag., 1953.

In trials carried out in Hungary against *Ascochyta* spp. on peas spraying after the fourth to fifth leaf stage with lime-sulphur or 1 per cent. Bordeaux at least three times at fortnightly intervals reduced the infection to a minimum.

Plant diseases. Bean rust.—*J. Dep. Agric. W. Aust.*, Ser. 3, 3, 4, pp. 439–440, 2 figs., 1954.

The occurrence of rust (*Uromyces phaseoli* [var.] *typica*) [*U. appendiculatus*] having been reported on the hitherto resistant Westralia runner bean [*R.A.M.*, 34, p. 425] at Richmond, New South Wales, seed of the Richmond line was obtained and the progeny tested in the glasshouse in Western Australia. They proved highly susceptible, though plants from certified Westralia seed produced in Western Australia were strongly resistant. It is evident, therefore, that the Richmond line of Westralia was not true to name. Westralia still appears to be resistant to all known Australian races of the rust.

Hamilton (R. I.) & Boosalis (M. G.). **Asexual reproduction in Cephalosporium gregatum.**—*Phytopathology*, 45, 5, pp. 293–294, 1 fig., 1955.

In a study at the Nebraska Agricultural Experiment Station on the factors influencing sporulation in cultures of *Cephalosporium gregatum*, the agent of brown stem rot of soy-bean [*R.A.M.*, 33, p. 574], the process was stimulated by temperatures ranging from 14·5° to 21° C. but no conidia were formed above 29°. The optimum pH lay between 5 and 6. Conidial production was induced in non-sporulating colonies by culture on a soy-bean stem agar medium without dextrose [28, p. 204], but on retransference to potato dextrose agar no further sporulation was observed.

As already reported, the normal method of asexual reproduction is by the formation of hyaline, continuous, ovoid to elliptical conidia, some of which, however, elongated within 24 to 36 hours and developed a well-defined median septum. On water agar the septate conidia frequently continued to elongate to several times their original length, forming additional septa. An abstriction at one end of a septate conidium gave rise to a hyaline, ovoid to elliptical, non-septate, bud-like projection, which tended to become detached from the parent conidium. In several cases budding was successive, up to ten buds having been observed round the tips of numerous elongated, septate conidia, although three was the maximum number actually seen being produced by one conidium in a colony flooded with immersion oil.

Yamaguchi (M.) & Welch (J. E.). **Varietal susceptibility of Celery to Aster yellows.**—*Plant Dis. Reptr*, 39, 1, p. 36, 1955. [Multilithed.]

An epiphytotic of aster yellows virus on Utah 10-B celery [*R.A.M.*, 32, p. 433] was reported from commercial fields at Brentwood, California, in 1952. In an experimental plot in one of the fields the percentage infection on Utah 52–70, Summer Pascal, Utah 10-B, and Utah 16 was 32·5, 39·5, 49·8, and 54, respectively. These figures may indicate preferences in the feeding habits of the leafhopper vectors rather than varietal differences in reaction to the virus.

1953/54 Groundnut investigations.—*Nyasld Fmr & For.*, 2, 3, pp. 14–16, 1954.

In field trials at the Agricultural Research Station, Lilongwe, Nyasaland, perenox sprays at 6 lb. per acre in 100 gals. of water controlled *Cercospora* leaf spot [*C. personata* and *C. arachidicola*: P. O. Wiehe, *Mycol. Pap. Commonw. Mycol. Inst.* 53, p. 8, 1953] on groundnuts of the Gambia variety, increasing yields by 70 per cent. The yield of Mwitunde was not increased significantly.

Edwards (R. L.). **Down to earth.**—*M.G.A. Bull., 1955*, 61, pp. 458, 460; 62, pp. 492, 494, 1955.

For mushroom cultivation [cf. *R.A.M.*, 33, p. 576; 34, pp. 205, 571], pressure treatment of the trays with Wolman's salt mixture is recommended, as the trays can then be used as soon as they are dry. The addition of nitrogen to manure already containing 2 per cent. is unprofitable. If in the grower's opinion the manure is not rich enough in droppings, then dried blood, poultry manure, or one of the proprietary activators may be added, the last mentioned at the start of composting and even then it may not be successful if composting is short. The quality of the original manure and the activator added may increase the yield by ½ lb. per sq. ft. or more.

In the second part of this paper the author deals with the problem of ventilation of mushroom houses [34, pp. 75, 341]. A 7,000 cu. ft. house with 1,600 sq. ft. of shelf beds and 20 tons of compost requires twice as much ventilation as a 600 sq. ft. house with floor beds and about 10 tons of compost.

In dry weather ventilation should be restricted, but with outside temperature

at 60° F. and relative humidity over 80 per cent. it should be free. Similarly, ventilation should not be restricted when temperature and air humidity in the house are maintained artificially. Four or more changes per hour are recommended, the rate of air movement over the beds not exceeding 20 ft. per minute. High bed temperatures increase oxygen consumption and necessitate more ventilation. A little ventilation during the spawn run in trays is advisable.

Pinkerton (M. H.). **Commercial Mushroom growing.**—223 pp., 20 pl., 14 figs., 11 diags., London, Ernest Benn, Ltd., 1954. 21*s*.

The author attempts to deal as simply and briefly as possible with every aspect of commercial mushroom-growing, including the latest methods and research findings, both in Great Britain and abroad. Chapter XI (pp. 164–182) includes notes on the symptoms, source of infection, development, and control of common mushroom diseases [*R.A.M.*, 34, p. 205]. In chapter XIII (pp. 199–216) the tray culture or two-zone system is described step by step [28, p. 268; 34, p. 571]. An index and bibliography are appended.

Jotani (Y.). **On the Fusarium wilt of the Colocynth plant.**—*J. Jap. Bot.*, 29, 9, pp. 279–281, 1954. [Japanese, with English summary.]

In the course of a search for a rootstock for watermelon resistant to *Fusarium* wilt [*F. bulbigenum* var. *niveum*] at the Botanical Institute, Tokyo Agricultural University, Setagaya, Tokyo, a similar disease on *Citrullus colocynthis* was investigated and found to be caused by the same pathogen.

Gaudineau [Marguérite]. **Maladies cryptogamiques de la Vigne.** [Cryptogamic diseases of the Vine.]—Conference held on 4th February, 1954, at the Centre for Agronomical Researches of the South-West, 5 pp., 1954. [Mimeographed.]

In this paper, published by the Gironde Chamber of Agriculture, the author discusses the current use of organic fungicides in controlling vine [downy] mildew [*Plasmopara viticola*] in France [*R.A.M.*, 34, p. 127 *et passim*] and the recent extension of anthracnose [*Elsinoe ampelina*: 24, p. 490], excoriosis [4, p. 525; 5, p. 145], and esca or parasitic apoplexy (*Stereum hirsutum*) [*S. necator*: 29, p. 347] which justifies a winter treatment. Experiments demonstrated the efficiency of organic fungicides, particularly captan at 500 gm. per hl. and zineb at 300 gm. [33, p. 277] in controlling downy mildew, provided they were applied frequently, though Bordeaux mixture is still recommended on account of its cheapness and persistence on the vines.

Excessive humidity in June and July, 1953, led to damage of productive hybrids by *E. ampelina*, notably Seibel 12·375, in Lande and Gironde. Winter treatment with a solution containing 30 kg. iron sulphate, 1 l. sulphuric acid, and 100 l. water is recommended in these localities. This treatment is also effective in cases of excoriosis, which has increased in Gironde in recent years. Esca is responsible for a high percentage of mortality among 20- to 25-year-old vines. In 1949, 12 and 15 per cent. of the untreated vines in a trial were diseased as opposed to 3 and 4 per cent. following treatment with sodium arsenite on 28th February. The same vines showed no disease after further treatment on 28th February, 1950. Dinitrocresol was also used up to 1 per cent. without being phytotoxic. The results with lower concentrations in comparison with sodium arsenite are awaited.

Branas (J.) & Bernon (G.). **Le plomb de la Vigne, manifestation de la carence de bore.** [The silver leaf disease of Vine, a manifestation of boron deficiency.]—*C.R. Acad. Agric. Fr.*, 40, 16, pp. 593–596, 1954.

Descriptions are given of symptoms observed since 1951 in vineyards in the departments of Pyrénées-Orientales and Rhône and ascribed to boron deficiency

[cf. *R.A.M.*, 34, p. 626]. No visible parasites are found on the affected plants and vegetative propagation does not transmit the symptoms, which appear on leaves shortly before flowering, at the time of maximum growth. Yellow spots rapidly coalesce, often becoming red, and finally dried in the centre. The leaves become swollen and leathery. In severe cases shoots die back suddenly 5 cm. or more from the tip and are replaced by 'witches' brooms', and heavy internal necroses may be found near the pericycle. If the symptoms described appear before anthesis the inflorescences fall, but if they develop subsequently the fruit is variously deformed.

The disease occurs in patches, sometimes a hectare or more in extent, and is confined to certain non-calcareous, leached soils, lacking clay. It is frequent and severe in the Roussillon, and less extensive in the silurian schists of Banyuls-sur-Mer and Albères. Symptoms disappear on transplantation to different soils or on application of boron at the rate of 100 kg. of borax per ha. which, however, may approach a toxic amount.

Baldacci (E.). **Le mildiou en Italie.** [Mildew in Italy.]—*Bull. Off. int. Vin* 280, 21 pp., 1954.

In this paper given at the 7th International Vine and Wine Congress, held in Rome from 13th to 20th September, 1953, the author reviews, with frequent references to the literature, the history, economic importance, symptoms, etiology, and control of and factors favouring infection by vine downy mildew (*Plasmopara viticola*) in Italy [see next abstract].

Calendario d'incubazione della Peronospora della Vite. [Incubation calendar of the Vine *Peronospora*.]—23 pp., 1 diag., Voghera, Pio Istituto Agricolo Vogherese 'C. Gallini', 1954 (eighth edition).

This edition of the spray calendar for forecasting outbreaks of vine *Peronospora* [*Plasmopara viticola*] in Italy [*R.A.M.*, 32, p. 605] contains directions for its use, sample sheets to be filled in by growers, notes on the biology of the fungus, technical terms used, and the action of the treatment in relation to vine development, and the use of non-copper materials [34, p. 342].

Bouchet (R.-L.), Payen (B.), Thellot (B.), & Thiollière (J.). **Intérêt de l'association zinèbe-cuivre dans la lutte contre le mildiou de la Vigne.** [The interest of the zineb-copper combination for the control of mildew.]—*Phytiatrie-Phytopharm.*, 3, 4, pp. 137–145, 1954.

Most of the information contained in this article has already been noticed from a different source [*R.A.M.*, 34, p. 572]. Economy of copper is of great importance and the use of a combination on vines against *Plasmopara viticola* is preferable to the use of organic fungicides, zineb and captan, alone, since their high fungicidal effect is mitigated by its shorter duration, by their ineffectualness against *Oidium* [*Uncinula necator*], and by occasional leaf discoloration; captan, moreover, is suspected of inhibiting fermenting yeasts. A stable zineb-copper product is now commercially available in France, Switzerland, and Italy under the trade mark 'cuprosan' [32, p. 9; 33, p. 404].

Cass Smith (W. P.), Harvey (H. L.), & Jamieson (W. R.). **Plant diseases. Black spot (anthracnose) of Grapes.**—*J. Dep. Agric. W. Aust.*, Ser. 3, 3, 4, pp. 433–439, 4 figs., 1954.

In a further spraying trial carried out at Upper Swan, Western Australia, in 1953–4 against vine black spot (*Elsinoe ampelina*) [*R.A.M.*, 33, p. 468] the vines used in the earlier test were given five applications (at the same stages of growth as before) of P.M.F. (phenyl mercuric fixtan), thiram, captan, ziram, and Bordeaux

mixture. Assessment of foliage infection on 16th December, 1953, showed that ziram and thiram had given highly satisfactory control, captan or Bordeaux mixture medium control, whilst P.M.F. was ineffective. On 8th March, 1954, bunch infection was negligible (severity index 0·4 to 1·5 on a scale of 0 to 100) on all vines except those treated with P.M.F. (29·3) [cf. 34, p. 699].

In another experiment, at Caversham, thiram, ziram, ziram (final application omitted), captan, zineb, and copper oxychloride were applied five times, as at Upper Swan. On 14th December, 1953, the severity indices for foliage infection were, respectively, 21·7, 11·67, 12·5, 27·12, 45·82, and 53·32, as against 87·5 for the unsprayed; the corresponding figures for the mature bunches on 4th March, 1954, were 2·97, 1·22, 0·67, 2·08, 8·4, 5·13, and 18·18. The average yields per plot were, respectively, 1,367, 1,678, 1,708, 1,475, 1,410, 1,350, and 487 oz.

The results in both seasons demonstrated that ziram and thiram compounds are highly effective against black spot when applied at a pressure of at least 200 lb. (1) at the late dormant to bud-swell stage at 3 lb. per 100 gals.; (2) when the shoots are 2 to 4 in. long (1½ lb.); (3) before flowering (1½ lb.); (4) after fruit set (1½ lb.); and thereafter whenever wet weather favours further infection. During pruning operations all cankered wood should be cut out and burnt.

MAILLET (P.). **Mise en évidence d'un antigène specifique dans les Vignes atteintes de la dégénérescence infectieuse.** [Demonstration of a specific antigen in Vines attacked by infectious degeneration.]—*C.R. Acad. Sci., Paris*, 241, 2, pp. 261–262, 1955.

This is a report of preliminary intraperitoneal and intravenous inoculation experiments on rabbits with sap from two lots of Rupestris du Lot vines, one in good condition from the School of Agriculture, Montpellier, France, and the other with infectious degeneration [court-noué: *R.A.M.*, 34, p. 342] from the Biological Station, Eyzies. Precipitation was effected with the sap from diseased vines at dilutions of 1 in 10 to 1 in 100, with a very slight reaction at 1 in 500. The serum dilution in the course of these reactions was 1 in 10. Positive results were also obtained at serum dilutions ranging from 1 in 25 to 1 in 1,000 with a sap dilution of 1 in 10. Tests with healthy sap gave uniformly negative results.

FUKUSHI (T.), WAKABAYASHI (M.), & OSHIMA (N.). **Effects of X-ray radiation upon virus diseased Potato tubers.**—*Mem. Fac. Agric. Hokkaido Univ.*, 1, 1, pp. 1–10, 3 figs., 1951. [Japanese, with English summary.]

The irradiation of potato tubers affected by crinkle mosaic [potato virus X+ potato virus A] using X-rays at a dosage of 7,000 to 20,000 R.U. [cf. *R.A.M.*, 32, p. 335] failed to inactivate or otherwise affect the virus although the sprouting of the tubers was delayed or even entirely suppressed. Similar treatment of tubers infected by leaf roll virus [loc. cit.] resulted in milder symptom expression but this effect was not transmitted to the progeny. Plants from the irradiated tubers exhibited malformations and gave a lower yield than diseased untreated controls.

MATSUI (C.). **Studies on the growth of SP_1 virus (Bact. solanacearum phage) and its mutant strain.**—*Sci. Bull. Fac. Agric. Kyushu*, 14, 1, pp. 43–49, 1953. [Japanese, with English summary. Abs. in *Biol. Abstr.*, 28, 9, p. 2177, 1954.]

In further work at Kyushu University, Japan [*R.A.M.*, 34, p. 633], SP_1 h_1 virus, the host range mutant from a single plaque of SP_1 virus, was sensitive not only to *Bacterium* [*Pseudomonas*] *solanacearum* strain S, but also to strain B 19, though SP_1 is sensitive only to strain S. SP_1 h_1 virus is serologically closely related to SP_1. The latent period, the rise period, and the average burst size are neither increased nor decreased by the multiple infection of viruses.

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